This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

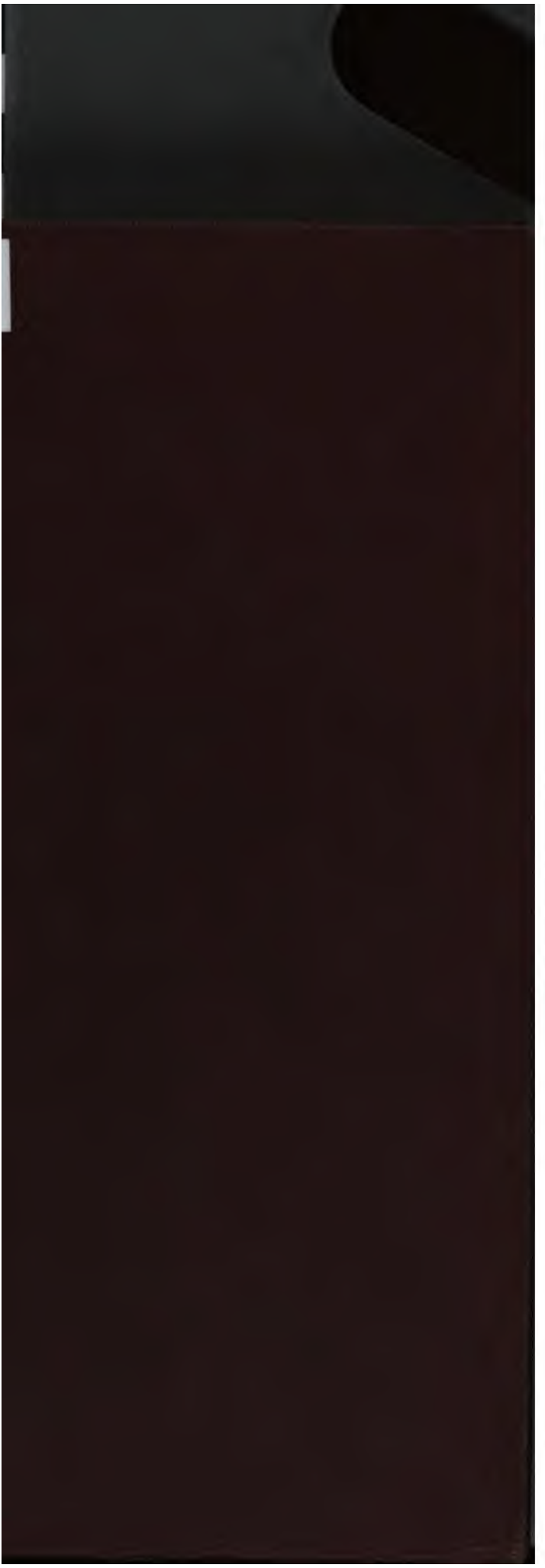
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`



West

THE NEW YORK
PUBLIC LIBRARY

Bibliographic Series No. 6

PAPERMAKING MATERIALS

ARTHUR D. LITTLE, Inc.
CHEMISTS AND ENGINEERS
Cambridge, Mass.

Reprinted from
THE PAPER TRADE JOURNAL
1920-1921.

READING LIST

ON

PAPERMAKING MATERIALS

Compiled by
CLARENCE JAY WEST

Information Department
ARTHUR D. LITTLE, INC.
Cambridge, Mass.

[This material was originally published as Contribution No. 23 of the Committee on Bibliography, Technical Association of the Pulp and Paper Industry.]

NEW YORK PUBLIC LIBRARY

Reprinted from
THE PAPER TRADE JOURNAL
1920-1921

THE NEW YORK
PUBLIC LIBRARY
205538
ASTOR, LENOX AND
TILDEN FOUNDATIONS
R 1921 L

COPYRIGHT, 1920, 1921
CLARENCE JAY WEST

NEW YORK
PUBLIC
LIBRARY

PAPERMAKING MATERIALS

Introduction.

The earliest paper was probably prepared from the papyrus plant (*Cyperus papyrus*). This is an aquatic plant common in many warm countries and especially in Egypt. From the layer between the flesh and thick bark of this reed or flag, strips or ribbons of different lengths were obtained, which were bleached in the sun and then spread upon a table and covered crosswise by other strips, moistened with water and pressed, thus causing adhesion of the strips by means of the vegetable mucilage naturally present in the bark (Davis). The oldest example of papyri known appears to be of the eighteenth dynasty of Egypt, or about 1700 B.C.

Papyri was followed by cotton and linen papers, and very much later, by straw and by chemical and mechanical wood pulp.

Though the threatened shortage of pulp wood has created renewed interest in other fibrous materials which may be used in the manufacture of paper, this interest is by no means confined to the present time. As early as 1765 Jacob Christian Schaeffer of Regensburg, Germany, published a work upon the different plants which he could transform into paper without the use of rags and gave specimens of papers prepared from poplar down, tree moss, hop tendrils, bark of grape vine, hemp, mulberry, aloe leaves, stinging nettle, bull-rush, cabbage stalks, water moss, turf, leaves of the lily of the valley, mallow, orache, Indian corn, genista, potato skins, etc., etc.

The next important historical document is probably that of Knoop, who printed part of his work on paper made entirely from straw. The paper is strong and tough, but of a light brown color, similar to straw wrapping paper, on which, however, even after one hundred years, the printed matter can easily be read. Since then, a very large number of fibrous materials have been tested for papermaking qualities. Davis in his "Manufacture of Paper," published in 1886, devotes 12 pages to a list of such materials. The wide variety will become evident from an examination of the list of plants which follows.

Classification of Papermaking Materials.

Clark [Paper xxiii, No. 25, 12 (Feb. 20, 1919)] has proposed the following classification of vegetable fibers used in papermaking:

A—Seed fibers, or seed hairs: growing from the seeds or seed-capsules of certain plants.

Cotton (Gossypium)

Bombax wool (East Indies) (Bombaceæ family)

B—Stem or Bast fibers: growing in the bast of certain dicotyledonous plants.
Flax or Linen (Linum usitatissimum)
Common hemp (Cannabis sativa)
Jute or Calcutta hemp (Corchorus capsularis and clitoris)
Sunn hemp (Crotolaria juncea)
Manila hemp (Musa textilis)
Esparto (Stipa tenacissima)
Straw
Barley
Oat
Wheat
Rye
Nettle fibers.
Common nettle (Urtica dioica)
China grass (Bœhmeria nivea)
Ramie (Bœhmeria tenacissima)

C—Leaf fibers: occurring in the leaves of certain monocotyledonous plants.
New Zealand hemp or flax (Phormium tenax)
Manila hemp (Musa textilis)
Sisal or Domingo hemp (Agave rigida)
Mauritius hemp or Aloe fiber (Fourcroya foetida)
Maguey hemp or Pita fiber (Agave americana)
Pineapple fiber (Ananas sativa)
Vegetable wool from green cones of Pine and Fir

D—Fruit fibers: the only member of value is the cocoanut fiber (Cocos nucifera).

E—Wood fibers: obtained by chemical treatment of the wood from the stem or trunk of various trees.
Coniferous or Resinous trees
Cypress, bald
Hemlock
Spruce
Pine
Cedar
Fir
Broad-leaf or Non-resinous trees
Tulip
Gum
Mulberry
Birch
Beech
Poplar

The late Mr. Surface adopted the following classification in preparing a list of papermaking materials, which is said to have

its foundation in the classification of Useful Plant Fibers as given by C. R. Dodge.

1 Textile papers—Wastes of industries, in which fiber is the chief product.
   (*a*) Spinning fibers in raw state; waste; seconds; tow; jute; butts; rope.
   (*b*) Spinning fibers after they have had a preliminary treatment or have already served a textile purpose; as rags.
2 Bast papers.
   Basts not used for textiles; as paper mulberry, adansonia.
3 Palm papers.
   Fibrous materials from palms or similar monocotyledons; as palmetto, yucca.
4 Bamboo and grass papers.
5 Wood cellulose papers.
   Chemical or mechanical wood pulp.
6 Papers from miscellaneous materials.
   Wastes of industries, in which fiber is not the chief product.
   Barks, leaves, down, hairs, etc.
   Bast, bark, and wood of shrubs and similar materials used together.

These are by no means the only classifications, but show the general classes which are to be considered in our study of papermaking materials.

Evaluation of a Papermaking Material.

William Raitt, of India, has given certain considerations regarding the tests to be applied to a new source of papermaking material. While all of these do not apply at the present time, they are given as originally proposed by Raitt (World's Paper Trade Rev.; Paper Trade Journal, April 15, 1909).

1 "It must have no value for any other economic purpose, neither to the spinner, rope maker, nor, to any exclusive extent at least, to the feeder of cattle.
2 "It must be a free gift of nature, of spontaneous self-sown growth, capable of natural reproduction, and not liable to exhaustion under a reasonable system of cropping. Its periodic removal must not imply an attack upon any form of capital wealth.
3 "It must mature annually, or at periods not exceeding three years, so that a pulp factory can obtain supplies from the area surrounding it in perpetuum.
4 "No fiber requiring cultivation is admissible. This does not of course, apply to fibrous material obtained as a by-product, *e. g.*, straw as a waste from grain cultivation.
5 "No material requiring manual or mechanical manipulation for the separation of the fiber from the body of the plant

is admissible, the cost of such separation being prohibitive, and such fibers being invariably of greater value to the spinner.

6 "Its habit must be gregarious and in sufficient local abundance to bring cost of cutting and collection within economic limits, a plant which grows in tufts or patches at long distances apart not being admissible.

7 "It must contain at least 30% of cellulose. This is an item which may vary in accordance with the local cost of other factors, but I think it is taking safe ground to assume that under no conditions will a yield of less than 30% pay.

8 "The total quantity available within economic collecting radius of a mill site must be sufficient to produce at least 2,500 tons of pulp annually. This is also a figure which must vary in accordance with the cost of other factors. Generally it will be much higher. I place it at that, because there are locations where the other conditions are so favorable that even this quantity will pay, and because it is doubtful whether any local advantages could bring a smaller quantity on to a profitable basis.

9 "No material is admissible which does not grow in a locality possessing cheap labor, and water for manufacturing uses.

10 "And it must grow within economic range of power, lime, and transport to seaport."

A study of these requirements would indicate that wood is probably the only material that fulfills these requirements at all perfectly. We know, however, that esparto has been successfully used for many years in Europe, and that straw, bamboo, bagasse, reed, cotton linters and other materials have been commercially used at various times. The success of any material of this kind must depend upon local conditions.

Method of Study.

Hofmann (1873), in discussing substitutes for rags as a raw material for papermaking, says:

"At present, when paper and papermaking have become, through more universal education, matters of importance to everybody, men, from almost all walks of life, consider it their vocation to discover new substitutes and methods of working them. They have never studied papermaking, are not aware that thousands of the best brains have been racked, and that hardly a plant exists which has not been tried or proposed for this purpose. We observe therefore the strange phenomena that now and then substances are proposed, and patents taken out, for new processes of making paper, which have perhaps been tried and condemned many years ago."

Because of this fact, it seems very desirable that our investigators adopt a uniform method of study and of reporting their results. At present we seem to be content to say that a given fiber contains such a percentage of cellulose, or that it gives such a yield of bleached pulp. The French school of papermaking has worked out a much more comprehensive method of study, which is described in detail by A. Ruby, engineer of the Berges Paper Mills, Iseres, France. He says [Papier, Sept., 1918; Paper xxiii, No. 18, 11 (Jan. 8, 1919)]:

"To fulfill its purpose, this technological index, among its many qualifications, should be able to furnish a complete record for the manufacturer consulting it, inform him as to the quality of the pulp, the yield of cellulose that could be claimed for it, enable him to determine the most suitable apparatus and decide on its proportions, inform him as to the nature and the quality of chemical substances to be set to work, and finally furnish him with all the data required in arriving at a cost price.

"The difference so frequently occurring between the promises of the laboratory and the results obtained in the mill, proceeds, almost always, from the obscurity in which some points have been left by the experiments. The technological index file must, therefore, be complete and precise. It should give, so far as possible, figures. It should specify the methods of analysis employed, above all, in the quantity of cellulose, where the results vary with the process."

It could be carried out, according to the following general plan:

1—*Description of the raw material.*
Scientific name.
Popular name.
Where grown.
Available quantity.
Appearance.
Present use.

2—*Study of the physical characteristics.*
Density.
Hardness.
Homogeneity.

3—*Study of the chemical characteristics.*
Water content.
Resins, fats and waxes contained.
Amount of ash.
Aqueous extract.
Nature and volume of the incrusting substance.
Proportion of cellulose.

4—*Study of treatment and its facility.*

(*a*) Cleaning, dusting and loss (apparatus).

(*b*) Sorting and loss (apparatus).

(*c*) Preliminary grinding or cutting and loss (apparatus).

(*d*) Digestion.

Density of digester charge.

Nature of the hydrolytic agent: soda, bisulfite of lime, etc.

Quantity necessary and concentration.

Temperature, pressure and period of cooking.

Loss in cooking.

(*e*) Grinding and duration of grinding (apparatus).

(*f*) Grinding to half stuff.

(*g*) Color and cleanliness of the unbleached pulp.

(*h*) Bleaching.

Quantity of bleaching agent necessary, ratio according to active chlorine.

Temperature necessary.

Degree of whiteness obtained.

Loss in bleaching.

(*i*) Beating.

Adaptability of the stuff for making slow or greasy pulp.

Balling or knotting.

(*j*) Formation into sheets.

5—*Quality of the cellulose.*

Character of fiber.

Amount of accessory elements.

Fiber:

Length.

Thickness.

Felting capacity.

Thickness of the membrane.

Influence on polarized light.

Tensile strength.

Homogeneity.

Flexibility.

Special characteristics.

Microchemical characteristics.

Accessory elements:

Nature.

Dimensions.

Special characteristics.

Microchemical characteristics.

Value of the pulp considered as an aggregate.

6—*Predominant character of this raw material.*

7—*Comparison with other recognized materials in use.*

Application of the System.

Ruby gives the following example of the application of his scheme of indexing, using a plant of the family Thymelæaceæ as his subject:

1—*Description of the raw material.*

Scientific name: *Thymelæa microphylla.*
Popular name: Metnane (Arabic).
Where grown: Algeria.
Abundance: Plant widely distributed. Borders of Tell and Sahara.
Appearance: Shrub, of which the branches, of the average thickness of a finger, are covered with a thick fibrous bark.
Present use: Used as fuel; has no value as fodder. The Arabs sometimes make yarn from the bark.

2—*Study of the physical characteristics.*

Density: 0.55.
Hardness: Soft.
Homogeneity: Substance but slightly homogeneous, the bark is very rich in fibers, but the outermost branches are almost destitute of it. On the other hand the bark contains very fine fibers, much superior to those in the wood of the shrub.

3—*Study of the chemical properties.*

Amount of water: 10.6 per cent.
Amount of resins, fat and wax: 0.9 per cent.
Ash content: 1.5 per cent.
Aqueous extract: 10.5 per cent.
Nature of the incrusting substance and contents: Lignin, pectin, 55 per cent.

Volume of cellulose.—The quantity of cellulose, determined by the Cross and Bevan chlorination method, runs up to 32 per cent of the gross weight of the thymelæa. There must be understood under this figure, the *total* cellulose, fibrous, and nonfibrous, contained in the bark and the wood of the shrub.

The yield of cellulose of the fibrous strands forming the bark alone, is 29.5 per cent.

4—*Study of the treatment and its facility.*

(*a*) Cleansing
(*b*) Sorting
(*c*) Cutting

} The woody fibers of thymelæa are slender and insignificant, those of the bark are very fine and worthy of interest.

The preliminary treatment will consist in separating the fibrous strands of the bark which should be digested by themselves. This separation could be effected, either by hand, by the natives at the time of gathering or by means of a barker composed of a rolling cutter, followed by a fan effecting a separation by gravity in a settling chamber.

The weight of the fibrous strands may be estimated as 30 per

cent of the gross weight of the branches: the loss by sorting, if we count as anything the wood of the thymelæa, therefore amounts to 70 per cent.

(*d*) *Digesting.*—Density of the charge for digesting. In pieces of about 5 centimeters (2 inches): 100 kilograms (220 lbs.) per cubic meter (250 gallons).

Nature of the hydrolytic agent. The incrusting substance consisting for the most part of pectcellulose, the alkaline treatment is plainly indicated. The hydrolytic agent should therefore be soda, or causticized carbonate of soda.

Quantity necessary and concentration. The quantity of soda necessary is 10 per cent, estimated in NaOH, of the gross weight of the fibrous strands.

The best concentration is 6° Baumé.

Temperature, pressure, period of cooking. The cooking should be done at atmospheric pressure, at 100° and should then be continued for three hours. Nevertheless, cooking under 3 kilograms pressure is preferable and the period of cooking is then reduced to two hours.

Loss in cooking: 60.5 per cent of the weight of the strands cooked.

Grinding. Unnecessary.

Grinding to half stuff. This operation, necessary for the separation of the fibers of the cooked strands, involves no peculiarities.

Color and cleanliness of the unbleached pulp. The unbleached pulp of Thymelæa microphylla is clean and in color it can be compared with unbleached spruce bisulfite pulp.

(*h*) *Bleaching. Quantity of bleaching agent.* Pulp easy to bleach by means of 3 parts of chlorine for 100 parts of dry pulp.

Temperature. The operation is assisted by a rise in temperature to 80°.

Degree of whiteness obtained. Snow white.

Loss in bleaching. Ten per cent.

(*i*) *Beating. Adaptability of the pulp for becoming greasy or slow.* Thymelæa becomes *greasy or slow* as readily as spruce pulp.

Balling or knotting not to be feared on account of the length of the fibers.

(*j*) *Formation in sheets.* The pulp of Thymelæa can be formed into extremely fine sheets without any difficulty.

5—*Quality of the cellulose extracted from the fibrous strands of the bark.*

Content in fibers: Ninety-five per cent.

Contents in accessory elements: Five per cent.

Fibers:

Length: 5 to 8 millimeters.

Thickness: 12 to 13 thousandths of a millimeter.

Felting capacity equals 1-500; remarkable.

Thickness of the membrane: Four to 5 thousandths of a millimeter.

Influence of the membrane on polarized light: Great birefringent power.

Toughness: Considerable toughness, resembling that of rags.

Homogeneity: Very homogeneous.

Flexibility: The fibers are particularly flexible; they bend and curve in every direction, without revealing the slightest fracture.

Microchemical character. The fibers are colored violet by the action of chloriodide of zinc, blue by nitrated iodide of calcium.

Accessory Elements:

Nature: Epidermic cellules.

Dimensions: Thirty to 40 thousandths of a millimeter.

Microchemical characteristics: Violet coloring by chloriodide of zinc, blue by nitrated calcium iodide.

Summary: The cellulose extracted from the bark of thymelæa considered as a whole—fibers and accessory elements—is very fine, being almost exclusively fibrous.

6—*Predominant features of this pulp*—Toughness, flexibility, length of fibers.

7—*Comparison and utilization*—The cellulose of the bark of *Thymelæa microphylla* is definitely comparable with that of other thymelæaceæ: Edgeworthia, Daphne, and Wickerstroemia and could be employed in the manufacture of fine papers in which strength is required.

Conclusion—Thymelæa microphylla contains cortical and ligneous fibers. The first named are remarkable, long, strong, flexible, silky, the latter very inferior, thin, fragile and lacking in felting capacity. The cellulose obtained from the bark consequently is alone interesting and very interesting. Unfortunately its yield, in relation to the whole, is very small, only 9 per cent, and for this reason its employment is limited.

Conditions in the United States.

Very recently the Forest Products Laboratory at Madison has concluded that American conditions are deemed unsuitable for plant fiber paper. They say:

1. "Plant stalks, straws, grasses, etc., usually contain a large percentage of pith, giving pulps low in fiber content and requiring high chemical consumption.

2. "Material of this type represents seasonal crops, so that facilities must be provided for the storage of a large volume of the stalk in order to permit the paper mill to operate throughout the year. The susceptibility of such material to decay adds greatly to the costs and difficulties of storage.

3. "Due to the bulkiness of these materials the digester charge is reduced, thereby reducing the yield and increasing overhead costs proportionately.

"Some of these fibers, such as straws, are being pulped at the present time for use in the manufacture of corrugated board and cheaper board products. Pulp of this nature, however, does not compare with a refined pulp such as sulfite or rag stock; it can be used only for special purposes and not in the manufacture of newsprint or high-grade paper. Plant fibers of this nature are being reduced commercially in Europe where economic conditions and the scarcity of wood permit their utilization."

Griffin [Paper Trade Journal lxvi, No. 6, 93 (Feb. 7, 1918] quotes Nathan A. Cobb, of the Department of Agriculture, in support of his contention that the annual plants cannot replace wood.

"'Wood is largely made up of fibrous cells. There are a few cells that are not fibrous, and the proportion by weight is comparatively small. This is reversed in the case of annual plants, in which the cells that are not fibrous exceed in volume the fibrous matter. This is a general statement which holds true throughout the whole vegetable world outside of the woods.

"'Thus the function of the annual plant, generally speaking, is not the development of a valuable stalk, as in the forest tree, but the production of flower or fruit, and having done this the plant dies, leaving behind its waste residues of stalks.'

"This statement is so reasonable and clear that it ought to settle the question, once for all, that there is no possibility of the great paper industry, established upon wood, subsisting on the waste stalks of annual growth."

In spite of these conclusions, and they are supported by any number of other observers, the papermaker may find himself forced to a consideration of such materials as bamboo, bagasse, cotton linters, and annual plants because of the shortsighted policy of our nation as a whole regarding the question of reforestation. It is the fact that these materials can be produced in a comparatively short period of time, while a forest is a matter of a lifetime, that brings them to the front at this time.

Scope and Plan of the Bibliography.

No one realizes the shortcomings and limitations of the following bibliography more than the compiler. The first and most serious

limitation is due to the fact that nowhere in the United States is there a complete set of the foreign papermaking journals. These conditions are best realized by an examination of Clark's List as published in Paper xxi, No. 4 (Oct. 3, 1917). This lack is the greater because of the fact that prior to 1907 there was no abstract journal which covered consistently the papermaking materials. Since that time the chemical side has been very well covered by Chemical Abstracts, and recently the whole industry has been covered by the Committee on Abstracts of the Technical Association of the Pulp and Paper Industry. For this reason, it is true that probably the greater portion of the early work is not covered in this reading list.

The papermaking materials have been listed in dictionary style under the common and botanical names, the references being given only under the latter. Oftentimes it has been hard to properly identify the material in question. In most instances it has been necessary to use the botanical name given by the author, since there was no way to check these. Certain obvious errors have, of course, been corrected.

Mention should also be made of the fact that the large number of woods commonly used in papermaking are not listed. The list is composed largely of vegetable fibers other than wood, though a few of the less common varieties are included. In nearly all cases, the references refer to actual experiments, with or without success, with the material, and not a mere mention of the fact that the material might be suitable for papermaking.

In view of the fact that numberless books and periodical articles refer to many papermaking materials, it has been thought best, in order to save space, to list these books and articles under the author (or title) in the dictionary arrangement, and to refer, under each material, to the author, and the year of publication.

It is the wish of the compiler to eventually complete this list and he therefore requests that all persons using this be kind enough to forward him all omissions and corrections which they may discover. This cooperation is absolutely necessary to secure the end desired by the Committee on Bibliography.

BIBLIOGRAPHY

A

Aainunnas. See *Ananas sativa.*

Abaca. See *Musa textilis.*

Abattoir products.

BIRD, H. J. Improvements in or relating to the manufacture of paper. English Patent 16,375. Sept. 13, 1892. J. Soc. Chem. Ind. xii, 461.

PAPER materials from the abattoir. Bull. fabr. papier; Paper Maker xlviii, No. 6, 802 (Dec. 1, 1914); Paper Making xxxiii, No. 8, 314-316.

Abelmoschus. See *Hibiscus.*

Abelmoschus esculentus. See *Hibiscus esculentus.*

Abelmoschus tetraphyllos. Bai bhenda.

Mierzinski, page 33.

Abroma augusta. Devil's cotton.

Dodge, C. R., 1897, page 34.
Spon, vol. I, page 911.
Watt, vol. I, page 8.

Abutilon avicennae. American jute. Indian mallow. Chira jute.

Dodge, C. R., 1897, page 35.
Dodge, 1910.
Mueller, L., 1877.

SKINNER, L. H. Paper pulp. English Patent 137,105. Dec. 30, 1918. C. A. xiv, 2707.

Watt, vol. I, page 15.

Abutilon bedfordianum. Brazilian mallow.

Dodge, C. R., 1897, page 37.
Guilfoyle.

Abutilon indicum. Country mallow. Kanghi. Potari.

Dodge, C. R., 1897, page 37.
Guilfoyle.
Lindsay, 1858.
Liotard, page 5.
Watt, vol. I, page 16.

Abutilon molle. Lantern flower. Soft-leaved abutilon.

Dodge, C. R., 1897, page 38.
Guilfoyle.

Abutilon striatum. Streaked lantern flower.

Dodge, C. R., 1897, page 38.

Abutilon venosum. Vined lantern flower.

Davis, 1886.

Acacia arabica.

Liotard.

Acacia avalica.

Liotard, page 7.

Acacia decurrens. Wattle bark.

PAPER from wattle bark. Paper Maker lv, No. 1, 42; No. 2, 149 (Jan. 1, Feb. 1, 1918).

PAPERMAKING trials with wattle bark and wood. Paper Maker lv, No. 6, 553-554 (June 1, 1918); Annual number, 1917-1918, page 75; Paper xxiii, 311, 358.

Phillips, S. C., 1915.

SINDALL, ROBERT W., and BACON, W. Wattle bark. Paper Makers' Mo. J. lv, No. 9, 273 (Sept. 15, 1917); Paper xxi, No. 16, 17.

SPENT wattle bark. Bull. Imp. Inst. xvii, No. 3, 247 (1919).

SPENT wattle bark and wattle wood. Bull. Imp. Inst. xv, 496-503 (1917); Paper Makers' Mo. J. lvi, 175-176 (June 15, 1918); Paper xxiii, 231; C. A. xii, 1711; Pulp Paper Mag. Can. xvi. 959.

WATTLE bark as papermaking material. Papeterie xli, 455 (1919); C. A. xiv, 122; Paper xxv, 833.

Acacia modesta. Phulahi.

Dodge, C. R., 1897, page 39.

Liotard.

Acacia penninervis. (Bark.)

Mueller, 1867, page 30.

Aconitum napellus. Wolfsbane. Monks'-hood.

Piette.

Adam's needle. See *Yucca gloriosa.*

Adansonia digitata. Baobab. Monkey bread tree of Africa. Sour gourd.

ADANSONIA fiber. Prakt. Handbuch Papierfabr. xlii, 1642-1643 (1896); J. Soc. Chem. Ind. xv, 611.

AFRICA and the pulp and paper industry. Papier, 1918, page 121.

BAOBAB as a source of papermaking materials. Paper Trade J. xlviii, No. 1, 30, 50 (Jan. 2, 1919).

BAOBAB fiber ideal papermaking material. Paper xxiv, No. 15, 588 (June 18, 1919).

BAOBAB wood and bark from South Africa. Bull. Imp. Inst. xv, 326-329 (1917); Paper Makers' Mo. J. lvi, 74-75 (Mar. 15, 1918); Paper xxiii, 173; Pulp Paper Mag. Can. xvi, 938; C. A. xii, 1251.

BAOBAB wood as raw material for paper. Papier-Ztg. xxxvii, 2452 (1912)

Adansonia digitata—Continued

BARTHELEMY, A. Wood and bark of the baobab tree. French Patent 369,657. Mar. 29, 1906. J. Soc. Chem. Ind. xxvi, 220.

BEADLE, C., and STEVENS, H. P. Swedish kraft paper from Adansonia fiber. Paper and Pulp xxv, 195 (1906); J. Soc. Chem. Ind. xxv, 440.

Charpentier, page 26.

Cross and Bevan, page 107.

DALEN, G., and WISBAR, —. Jute, manila and Adansonia. Mitt. kgl. mech.-tech. Versuchs. xx, No. 5, 51-56 (1902); J. Soc. Chem. Ind. 21, 1466.

Dodge, C. R., 1897, page 41.

FIBERS from the Belgian Congo. Bull. Imp. Inst. xiv, 385-388 (1916); Paper Makers' Mo. J. lv, 9-10 (Jan. 15, 1917).

FIBERS of Adansonia digitata. Bull. Imp. Inst. v, 118-119 (1907); C. A. ii, 458; J. Soc. Chem. Ind. xxvi, 987.

FINEST papermaking material in nature. Paper Maker lvii, No. 6, 629-630 (June 2, 1919).

Griffin and Little, page 128.

HERZBERG, W. Adansonia paper. Mitt. kgl. mech.-tech. Versuchs. viii, 82-89 (1890); J. Soc. Chem. Ind. ix, 758.

Herzberg, 1902.

Hofmann, 1897, pages 1642-1643.

Höhnel, page 118.

Hübner, 1903, page 17.

Imperial Institute, 1909.

Juritz, page 71.

Liotard.

MELL, C. D. Baobab bark for papermaking. Paper Trade J. lvi, No. 8, 183 (Feb. 20, 1913).

NEW papermaking fibers. Paper Maker liii, No. 1, 39 (Jan. 1, 1917).

Phillips, S. C., 1915.

PREPARATION of Adansonia fiber. Paper x, No. 11, 184 (Feb. 26, 1913).

REMINGTON, J. S., BOWAK, D. A., HEALD, T. P., and DAVIS, A. Adansonia digitata (baobab) tree bark as a papermaking material. Aynsome Annual iii, 62-75 (1911); World's Paper Trade Rev. lvi, No. 10, 433-440, 456 (Sept. 8, 1911); Paper v, No. 1, 9-12 (Sept. 20, 1911); Paper Trade J. lv, No. 25, 44 (Dec. 19, 1911); Paper Mill xliii, 17 (1911); Papier-Ztg. xxxvi, 3329-3330 (1911); C. A. vi, 422, 3017.

Spon, vol. I, page 912.

Adansonia digitata—Continued

VIDAL, L. Utilization of the wood of the baobab in papermaking. Moniteur, Aug. 15, 1912, pages 371-379.

Watt, vol. I, page 105; vol. VI, part 1, page 107.

Aeschyomene paludosa. *Tetropanax papyrifera.* Rice paper plant.

CHEVALLIER, J. B. A. Notice sur le papier de riz, sa nature ——— Paris, 1840. 12 p. 8°.

Article on rice paper, its nature.....

Mierzinski, page 5.

SETLIK, B. Japanese papers. Papier-Ztg., Oct. 24, 1909.

African bowstring hemp. See *Sansevieria guincensis.*

African button flower. See *Dais continifolia.*

African millet. See *Eleusine coracana.*

Afrika stammenden.

Kirchner, II, page 875.

Agave.

AGAVE fiber. Experiments in India. Paper Mill xxv, No. 17, 14 (July 5, 1902).

AGAVE fiber industry. Paper Makers' Mo. J. xl, No. 2, 47-48 (Feb. 15, 1902); J. Roy. Soc. Arts 1, 102 (1901).

See also *Furcraea gigantea.*

Agave americana. Century plant. American aloe. Maguey. Pita. Aloes.

Dodge, C. R., 1897, page 43.

Griffin and Little, page 129.

Leighton, J., 1918.

LESPINASSE, A. J. Mexican plants. Paper Trade J. liii, No. 21, 52 (1911).

Liotard.

Montessus de Ballore, page 270.

Richmond, 1906.

Schaeffer, 1772.

Skinner, 1907.

Spon, vol. I, page 912.

Watt, vol I, page 141; vol VI, part 1, page 107.

Agave cantula. Maguey.

Boomer, 1919.

Brown and Fischer, Bull. 16, page 9.

Agave heteracantha. Istle. Ixtle fiber. Lechuguilla. Mexican fiber. Tampico hemp.

Bull. Misc. Inform., Kew, Dec., 1887, page 5; Oct., 1890, page 220.

Dodge, C. R., 1897, page 46.

von Streeruwitz.

Agave ixtli. See *Agave rigida.*

Agave keratta.

Griffin and Little, page 129.

Agave mexicana. Maguey.

Dodge, C. R., 1897, page 47.

Mierzinski, page 21.

Agave rigida sisalana. Sisal hemp of Florida. Henequen. Sisal. Sisal grass.

BAIRD, PAUL. Utilization of agave waste. Moniteur xlvii, No. 9, 201, 203, 205 (1911).

Dodge, C. R., 1897, page 48.

GRACEY, W. T. New uses for by-products of henequen. Daily Consular and Trade Reports, July 10, 1913, page 188; Paper Maker xlvi, No. 3, 432 (Sept. 1, 1913); Paper xii, No. 9, 34 (Aug. 13, 1913).

Griffin and Little, page 129.

HORT, L. B. Henequen as a source of kraft paper. Paper xv, No. 25, 20 (Mar. 3, 1915); Paper Maker xlix, No. 6, 626 (June 1, 1915).

Juritz, page 85.

Kirchner, II, page 75.

Norton, 1910.

PAPER from henequen by-products. Paper Makers' Mo. J. liv, 327 (Nov. 15, 1916); World's Paper Trade Rev. lxvi, No. 20, 892 (Nov. 17, 1916).

PAPER from henequen by-products. Paper Mill, Mar. 6, 1915, page 32; J. Roy. Soc. Arts, Apr. 9, 1915, page 480; Paper Maker xlix, No. 4, 451 (Apr. 1, 1915); World's Paper Trade Rev. lxv, No. 15, 620 (Apr. 9, 1915); No. 17, 700 (Apr. 23, 1915).

PAPER from Mexican henequen plant stumps. World's Paper Trade Rev. lx, No. 8, 348 (Aug. 22, 1913).

PAPER of sisal hemp. Paper iii, No. 7, 22 (May 3, 1911).

POSTL, H. Paper of sisal hemp. Papierfabr. ix, No. 3, 63-64 (Jan. 20, 1911).

RAINES, RALEIGH. The sisal fiber plant. Pulp Paper Mag. Can. xi, No. 10, 352-353 (May 15, 1913).

SISAL hemp paper. World's Paper Trade Rev. lv, No. 5, 194 (Feb. 3, 1911).

SISAL hemp from East Africa, Uganda, and Nyassa. Bull. Imp. Inst. vii, 160-161 (1909); J. Soc. Chem. Ind. xxviii, 978.

UTILIZATION of sisal refuse. Paper Makers' Mo. J. liv, 308 (Oct. 16, 1916).

Agave variegata. Varigated aloe.

Liotard.

Agave vivipara. Agave or green aloes. Bastard aloe.

Dodge, C. R., 1897, page 52.

Liotard.

Montessus de Ballore, page 269.

AGRICULTURE and forestry as producers of raw materials for papermaking. Papier-Ztg. xxxix, 303-304, 343-344 (1914).

Agropyrum repens. Quack grass. Couch grass. (Roots.)

DUFFEK, A., and MERREL, A. Cellulose suitable as a raw material for paper and other purposes. English Patent 24,272. Dec. 18, 1895. J. Soc. Chem. Ind. xv, 372.

Agrostis canina. Brown grass.

Davis.

Agrostis spica-venti. Bent grass.

Davis.

Ailanthus glandulosa. Chinese sumac.

FEDELE, V. The ailanthus as a paper-yielding plant. La Nuova Agricultura del Lazio v, 345 (1917); Bull. Agr. Intelligence ix, No. 2, 194 (Feb., 1918); Paper xxiii, 230; Pulp Paper Mag. Can. xvi, 959; J. Forestry xvi, No. 5, 616 (1918); C. A. xii, 1512.

McElhenie, 1910.

Alacle.

Strother, 1883.

Alang-alang.

HAVIK, H. G. Papermaking materials in Java. Papierfabr. x, 859-868 (1912); C. A. vii, 1607; J. Soc. Chem. Ind. xxxi, 768.

Albizzia moluccana.

Hanausek, T. F., 1911.

Havik, H. G., 1911, 1912.

Alfa. See *Stipa tenacissima.*

Alfalfa. See *Medicago sativa.*

Alga marina. *Seaweed.*

Charpentier.

FLAUNET, C. Seaweed as a papermaking material. Papier xxii, 149 (May, 1919); Paper xxiv, No. 20, 882 (July 23, 1919).

GLOESS, M. P. P., DARRASSE, L. P. J., and DARRASSE, E. R. Cellulose from seaweed. U. S. Patent 1,103,283. July 14, 1914. Paper xx, No. 10, 15, 40 (May 16, 1917).

GREEN, S. Mode of making paper from alga or seaweed. U. S. Patent. Feb. 15, 1809.

KUESS, ——. Manufacture of paper pulp from seaweed. French Patent 394,494. Sept. 21, 1908. Paper Making xxix,

Alga marina—Continued

No. 9, 330 (Sept., 1910); J. Soc. Chem. Ind. xxviii, 257; C. A. iv, 109.

KAMADA, JINTANO. Paper from seaweed (obamo?). World's Paper Trade Rev. lxi, No. 2, 100 (Jan. 9, 1914).

PAPER from seaweed. World's Paper Trade Rev. lxx, 11 (1918); Paper xxiii, 311; Pulp Paper Mag. Can. xvi, 2005.

PAPER from seaweed pulp (ajimo). Paper Maker lix, No. 4, 488 (Apr. 1, 1920); Paper xxvi, No. 6, 264 (Apr. 14, 1920); Pulp Paper Mag. Can. xviii, No. 14, 362.

PAPER pulp from seaweed. Paper Makers' Mo. J. xlviii, No. 8, 295 (Aug. 15, 1910).

SEAWEED. Paper Trade J. lix, No. 2, 54 (July 9, 1914).

SEAWEED in papermaking. Paper Making xxix, No. 4, 148, 150 (Apr., 1910).

SEAWEED for papermaking. Paper Makers' Mo. J. xlvi, No. 1, 11 (Jan. 15, 1908).

SEAWEED pulp. Paper Making xxix, No. 5, 192 (May, 1910).

SEAWEED pulp for paper. Paper xxvi, No. 6, 264 (Apr. 14, 1920).

WRAPPING paper from seaweed. Paper Makers' Mo. J. li, 291 (July 15, 1913).

Algerian mallow. See *Lavatara cretica.*

Allium sativum. Garlic.

Davis.

Aloe (aloes). See *Agave americana.*

Alpina magnifica. Mulberry.

USHIJIMA, G. Treating mulberry fiber for papermaking. Japanese Patent 29,962. July 16, 1917. C. A. xii, 224.

Alpina nutans. Light galangal.

BEADLE, C., and STEVENS, H. P. The ginger plant order. Its value for papermaking. Paper Trade Rev. lix, No. 21, 1-3; Paper xi, No. 6, 17-18 (Apr. 23, 1913); J. Soc. Chem. Ind. xxxii, No. 6, 259-260 (Mar. 31, 1913); C. A. vii, 2306.

NEW source of paper. Bull. Misc. Inform., Kew, 1912, No. 9; C. A. vii, 889.

Alstonia scholaris. Dita.

Richmond, 1908.

Althaea frutex. Cockle-burr.

Lindsay, 1858.

Althaea officinalis. Marsh mallow.

BELANI, E. New raw materials for papermaking. Papierfabr., 1908, 2305; J. Soc. Chem. Ind. xxvii, 1080.

Lindsay, 1858.

Schaeffer, 1772.

Vilette.

Althaea rosea. Hollyhock.

Dodge, C. R., 1897, page 55.

Lindsay, 1858.

Munsell, page 56.

Ambaree. See *Hibiscus cannabinus.*

Ambari hemp. See *Hibiscus cannabinus.*

American aloes. See *Agave americana.*

AMMON, P.

Paper pulp in French West Africa. J. offic. Afrique occid. franc; Paper Making xxviii, 437 (1909); J. Soc. Chem. Ind. xxviii, 1,269.

Ammophilia arenaria. (Syn. *Ammophilia arundinacea, Psamma arenaria.*) Beach grass, bent grass, marram grass, marum, moram, sea marram, sea matweed, sea reed, etc.

BEADLE, C., and STEVENS, H. P. Marram grass for papermaking. Bull. Misc. Inform., Kew, 1912, No. 9, 396; Paper Maker xlv, No. 3, 402 (Mar. 1, 1913); Paper x, No. 5, 25 (Jan. 15, 1913); Paper Makers' Mo. J. li, 55-56 (Feb. 15. 1913); Pulp Paper Mag. Can. xi, No. 5, 160 (Mar. 1, 1913); C. A. vii, 889.

BEADLE, C., and STEVENS, H. P. Marram grass for papermaking. Bull Misc. Inform., Kew, 1913, No. 9, 363-366; Paper Maker xlvii, 251-252 (Feb. 2, 1914); Paper xiii, No. 18, 15-16 (Jan. 14, 1914); Paper Trade J. lviii, No. 7, 52 (Feb. 12, 1914); Papier-Ztg. xxxix, 64; C. A. viii, 1,345.

Dodge, C. R., 1897, page 55.

Earl, J. C., Bull. No. 1 (1916).

Juritz, 1919, page 79.

Lightfoot, Bull. 11, page 29.

Lindsay, 1858.

MARRAM grass. Paper Making xxxv, No. 4, 124-126.

MARRAM grass for papermaking. Paper Trade Rev. lxi, No. 2, 2.

OLIVER, W. C. Substitution of raw material. Paper Maker lvi, No. 4, 315 (Oct. 1, 1918).

Phillips, 1915, page 631.

POSSIBLE raw materials for papermaking. Paper Maker lvi, No. 4, 314 (Oct. 1, 1918).

SCOTT, J. The marram grass and its fiber. Paper Maker, Annual No., 1912-1913, 283-286.

Spon, vol. I, page 994.

Ammophilia arundinacea. See *Ammophilia arenaria.*

Amomum hemisphericum.

Beadle and Stevens, 1912.

Ampas. See *Bagasse.*

Ampelodesma tenax. Diss.

Dodge, C. R., 1897, page 56.

NEW materials for the manufacture of paper. **Moniteur** des produits chimiques, May 10, 1891; J. Soc. Chem. Ind. x, 565.

Spon, vol. I, page 917.

Valenta, 1904.

See also *Stipa tenacissima.*

Amyris papyrifera.

Olmedilla.

Anacharsis. See *Elodium canadensis.*

Ananas sativa. Ananas. Pineapple.

BEADLE, CLAYTON, Pineapple fiber. J. Roy. Soc. Arts lxiii, 631 (1915); Paper Maker liii, No. 1, 39 (Jan. 1, 1917).

CULTIVATION of the pineapple fiber. Bull. Imp. Inst. xiv, 454-456 (1916).

Dodge, C. R., 1897, page 57.

FIBERS from ananas leaves. World's Paper Trade Rev. lx, No. 9, 392 (Aug. 29, 1913).

Kirschner, II, page 75.

Liotard, page 18.

Phillips, 1915, pages 263, 375.

PINEAPPLE fiber. Bull. Misc. Inform., Kew, Apr., 1887, page 8; Selected Papers, I, 109.

PINEAPPLE fiber. Paper Maker liv, 315 (Oct. 1, 1917); Pulp Paper Mag. Can. xv, 1,215 (Dec. 21, 1917); Paper Makers' Mo. J. lv, 10 (Jan. 15, 1917); lvi, 41 (Feb. 15, 1918).

Spon, vol. I, page 917.

UTILIZATION of pineapple leaves. J. Chem. Met. Soc. S. Africa, Aug., 1913, page 109.

Watt, vol. I, page 236.

WILCOX, E. V. Ananas leaves for pulp. Paper x, No. 12, 34 (1913); Z. angew. Chem. xxvi, 250 (1913).

Andropogon buchananii. Dek grass. Thatching grass.

SOUTH AFRICAN grasses for papermaking. Bull. Imp. Inst. xvi, No. 2, 127-134 (1918); Paper Maker, Intern. No. 1918-1919, 70; Paper xxiv 711; Papier xxii, 117 (1919); Agr. News xviii, 39 (1919); C. A. xiii, 515.

Andropogon contotrus.

See above reference.

Andropogon dregeanus.

See above reference.

Andropogon hirtiflorus.

See above reference.

Andropogon intermedius. Savannah grass.

Raitt, 1913.

Andropogon martini. Roussa grass.
Hannan, page 139.
Spon, vol. I, page 919.

Andropogon muricatus. Whorl flowered bent grass.
WHORL flowered bent grass (*Andropogon muricatus*) as a papermaking material. Bull. syndicat fabricants papier carton, France, 19.0, No. 1, 4-8; C. A. xiv, 622.

Andropogon nardus. Citronella grass. Mana. Savannah grass.
Dodge, C. R., 1897, page 61.
Leighton, J., 1918.
Raitt, 1913.
Watt, vol. I, page 249.

Andropogon oregeamus.
See reference under A. buchananii.

Andropogon rufus.
Norton, 1910.

Andropogon sorghum vulgaris. Broom corn. Millet.
Brand, C. J., 1911.
Dodge, C. R., 1897, page 59.
Hanausek, 1911.
NEW pulp. Wochbl. Papierfabr, xliii, 3497-3498 (1912); C. A. vi, 3517.
USES of Manchurian millet. Paper Makers' Mo. J. li, 53 (Feb. 15, 1913).
Walsh, G. E., 1917.

Andropogon squarrosus. Cuscus. Khus Khus. Koosa. Savannah grass.
Dodge, C. R., 1897, page 60.
Lightfoot, Bull. 11, page 34.
Liotard.
Raitt.
Royle, 1855, page 32.
Watt, vol. I, page 246.

Anhinga.
BRAZILIAN anhinga fiber for paper. Commerce Reports, Nov. 18, 1919; Paper xxv, 707 (Dec. 10, 1919).
PAPERMAKING fibers in Brazil. Paper Maker lv, No. 4, 353 (Apr. 1, 1918).

Anisoptera vidaliana. Mayapis.
Richmond, 1908.

ANNANDALE, ALEX.
PAPERMAKING in South Africa. Pulp Paper Mag. Can. xii, No. 15, 459-460 (Aug. 1, 1914); Paper Maker xlviii, No. 4, 515-517 (Oct. 1, 1914).

Anona reticulata. Anona. Bullock's heart. **Custard apple of** the West Indies. Nona.
Cross, Bevan, and King, page 48.
Davis.
Dodge, C. R., 1897, page 61.
Watt, vol. I, page 258.

Anona squamosa. Sour sop.
Cross, Bevan, and King, page 48.
Dodge, C. R., 1897, page 61.
Watt, vol. I, page 260.

Anonaceae. Papaw.
Davis.

Anthistiria arundinacea. Savannah grass.
Dodge, C. R., 1897, page 62.
Phillips, 1915, page 143.
Raitt, 1913.

Anthistiria villosa. Savannah grass.
Phillips, 1915.
Raitt, 1913.

Antiaris saccidora. Sacking tree. (Bark.)
Liotard, page 5.
Spon, vol. I, page 919.

Antiaris toxicaris. Upas tree. Travancore sacking tree.
Dodge, C. R., 1897, page 62.
Watt, vol. I, page 268; vol. VI, part 1, page 107.

Aphanthe aspera.
Rein.
SETLIK, B. Japanese papers. Papier-Ztg., Oct. 24, 1907.
STATE of the paper industry in Japan. Daily Consular and Trade Reports, April 8, 1914. 164-177; J. Roy. Soc. Arts, Feb. 20, 1920; Paper xxiv, No. 10, 384 (May 14, 1919).

Apocynacea. Dogbane.
Davis.

Apocynum cannabinum. Colorado hemp. Indian hemp.
Dodge, C. R., 1897, page 62.
DYER, H. C. Indian hemp (refuse plant fiber). Indian Pharmacologist i, 85 (1896); J. Soc. Chem. Ind. xvi, 62.
Hannan, page 129.
Spon, vol. I, 919.

Aporentype.
Davis.

Apple pomace.
BIGELOW, W. D., and GORE, H. C. Study of apple marc. J. Am. Chem. Soc. xxviii, 200-207 (1906); J. Soc. Chem. Ind. xxv, 330.

Aquilaria agallocha.

Hooper, 1909-1910.

Watt, vol. I.

Aralia papyrifera. See *Fatsia papyrifera.*

Araucaria imbracata. Monkey puzzle tree.

BRAZILIAN wood for papermaking. Paper Trade J. lxiii, No. 19, 46 (Nov. 9, 1916); Paper Maker lii, 537 (Dec. 1, 1916).

ROBERTSON, W. H. Some new fibers for papermaking. Commerce Reports, No. 250, 360-361 (1915); C. A. x, 274.

SOME new sources of paper fibers. Paper Maker li, 163 (Feb. 1, 1916); lii, No. 1, 27 (July 1, 1916).

ARCHER, THOMAS CROXEN.

See British manufacturing industries. Edited by G. Phillips Bevan. London, E. Stanford, 1876-1877. Vol. 8, Paper, etc.

Arctium lappa. Burdock.

Dodge, C. R., 1897, page 64.

Lindsay, 1858.

Schaeffer, 1772.

Areca catechu. Adki. Betel nut palm.

Dodge, C. R., 1897, page 65.

Hooper, 1909-1910.

Liotard.

Spon, vol. I, page 919.

Watt, vol. I, page 298.

Arenga saccharifera. Ejoo. Sago palm of Malacca.

Dodge, C. R., 1897, page 66.

Mierzinski, page 18.

Mueller, L., 1877.

Piette.

Watt, vol. I, page 302.

Aristida.

Juritz, page 66.

NEW raw materials for papermaking. Bull. Imp. Inst. x, 372-379 (1912); Papier-Ztg. xxxvii, 3537-3538 (1912); C. A. vii, 1286; J. Soc. Chem. Ind. xxxi, 1074.

Aristida cyanantha. Savannah grass.

Raitt, 1913.

Aristida setacea. Broom straw.

Liotard.

ARNOT, WILLIAM.

Technology of the paper trade. (Cantor Lecture, Society of Arts.) J. Roy. Soc. Arts, London, 1877.

Arrache. See *Hibiscus esculentus.*

Arrowhead. See *Sagittaria sagitifolia.*

Arrowroot. See *Maranta arundinacea.*

Artemisia moxa. Wormwood.
Dodge, C. R., 1897, page 67.

Artemisia vulgaris. Mugwort.
Dodge, C. R., 1897, page 67.
Lindsay, 1858.

Artichoke.
See *Cynara.*
See *Helianthus tuberosus.*

Artiplex.
Davis.

Artocarpus incisa. Breadfruit tree.
Dodge, C. R., 1897, page 69.
Watt, vol. I, page 330.

Arundinaria gigantea. Cane.
Dodge, C. R., 1897, page 69.
Hoffmann, 1873, pages 310-312; 1897, pages 1639-1640.
LOWE, HENRY. Paper stock from reeds. U. S. Patent 20,884. July 13, 1858.
Munsell, 1864.

Arundinaria macrosperma. See *Arundinaria gigantea.*

Arundinaria tecta. Lesser cane. Small cane.
Dodge, C. R., 1897, page 69.
U. S. Department of Agriculture, Report, 1879, page 563.

Arundo arenaris. See *Ammophila arenaria.*

Arundo colorata.
Mueller, L.

Arundo conspicua. Plume grass.
Davis.

Arundo donax. Savannah grass. Scriptural reed. Spanish reed.

BEVERIDGE, JAMES. Arundo donax cane as a paper-making fiber. Pulp Paper Mag. Can. xiii, No. 1, 15-16 (Jan. 1, 1915); Paper Maker, Intern. No., 1914-1915, page 92; Paper xv, No. 20, 20-21 (Jan. 27, 1915); Paper Making xxxiv, No. 3, 88-90; World's Paper Trade Rev. lxiii, No. 6, 214 (Feb. 5, 1915); C. A. ix, 714; J. Soc. Chem. Ind. xxxiv, 418.

Charpentier.

DELAPIERRE, —. Arundo donax. Dingler's polyt. J., 1832, 69; Bull. soc. encour. ind. nat., Dec., 1831.

Dodge, C. R., 1897, page 70.

EXPERIMENTS with new materials for the manufacture of paper. Bull. Imp. Inst. x, 372-379 (1912); Papier-Ztg. xxxvii, 3537-3538; C. A. vii, 1286; Papierfabr. xi, 207-208 (1913).

HAGEMANN, C. G. Production of pulp and textile fiber. English Patent 18,470. Oct. 27, 1891. J. Soc. Chem. Ind. xi, 1026.

Arundo donax—Continued

HERZBERG, W. A new raw material for the paper industry. Mitt. kgl. mech.-tech. Versuchs. xiii, No. 1, 24-29 (1895); J. Soc. Chem. Ind. xiv, 675.

Juritz, page 85.

Kirchner, vol. II, page 56.

Montessus de Ballore, page 272.

Phillips, 1915, page 261.

Raitt, 1913.

Valenta, 1904.

Arundo festucoides. Diss.

Montessus de Ballore, page 272.

Mueller, L.

Arundo phragmites. Reed.

Hannan, page 138.

Montessus de Ballore, page 272.

Arundo sellowiana. Pampas grass.

Mueller, L.

Spon, vol. I, page 920.

Asclepias fruticosa.

FIBERS from different places. Bull. Imp. Inst. xv, 7-23 (1917); J. Soc. Chem. Ind. xxxvi, 1003.

Asclepias incarnata. Swamp milkweed.

NEISH, A. C. Milkweed as a source of paper. J. Soc. Chem. Ind. xxxii, No. 2, 72-73 (1913); Paper x, No. 10, 19-20 (Feb. 19, 1913); Paper ix, No. 13, 27 (Dec. 11, 1912); Paper Maker, Mar. 1, 1913, 428; C. A. vii, 1301, 1806.

Asclepias syrica. Milkweed. Silk weed. Silk plant.

Dodge, C. R., 1897, page 70.

Neish. See *Asclepias incarnata.*

Phillips, 1915, page 33.

Schaeffer, 1772.

Asparagus. See *Asparagus officianalis.*

Asparagus officianalis. Asparagus.

MIRUS, —. Cellulose from the asparagus plant. Wochbl. Papierfabr. xliv, 197-198 3700 (1913); Paper x, No. 11, 38 (Feb. 26, 1913).

PAPER from garbage and asparagus stock. Paper Maker liv, No. 4, 348.

REINKE, OTTO. Production of pure asparagus cellulose. Chem.-Ztg. xxxvii, 81; C. A. vii, 2113; J. Soc. Chem. Ind. xxxii, 132.

REINKE, OTTO. Recovery of cellulose from asparagus. Daily Consular and Trade Reports, Mar. 29, 1913; Paper xi, No. 5, 23 (Apr. 16, 1913).

Asphodelus ramosus. Asphodill.

BADOIL, A. Industrial treatment of asphodel. **French** Patent 423,034. Nov. 23, 1910. J. Soc. Chem. Ind. **xxx, 642.**

BADOIL, A. Preparation of half stuff. **French Patent** 392,750. June 27, 1908. J. Soc. Chem. Ind. xxviii, **38 (1909).**

BADOIL, A., and VALADON, J. E. **Dyestuff from as**phodel root. French Patent 333,478. Nov. **28, 1903.** J. Soc. Chem. Ind. xxiii, 712.

Aspidium filix.

Mierzinski, page 11.

Astelia banskii. Rush.

Dodge, C. R., 1897, page 73.

Asthoder.

Davis.

Atriplex halimus. Salt bush.

AUSTRALIAN papermaking woods and fibers. **Paper xxiv,** No. 2, 37-38, 66 (Mar. 19, 1919).

Lightfoot, Bull. 11, page 28.

Attalea funifera. Bahia piassaba or pissava.

Dodge, C. R., 1897, page 75.

Mierzinski, page 21.

Australian mallow. See *Lavatera plebeia.*

Australian mat rush. See *Xerotes longifolia.*

Australian meadow grass. See *Poa coespitosa.*

AUSTRALIAN papermaking woods and fibers. **Paper xxiv, No.** 2, 37-38, 66 (Mar. 19, 1919).

Avena sativa. Oats.

Piette.

See also *Straw.*

Avistida.

Phillips, 1915, page 261.

Avoava bark.

HUNT, —. Paper from avoava bark. Paper Makers' **Mo.** J. xl, No. 3, 82 (Mar. 15, 1902); Paper Mill xxiv, No. 49, 28, (Dec. 7, 1901).

B

Bagasse. Ampas. Megass. Sugar cane refuse.

AMERICAN FIBER CO. Use of cane fiber for papermaking. New York, 1873.

Annandale, 1914.

BAGASSE. Paper Trade J. xlii, No. 15, 54, 58; No. 17, 38, 42 (Apr. 12, 26, 1906); xliii, No. 2, 42, 46 (July 12, 1906).

BAGASSE. Paper Making xxviii, No. 1, 19 (1909).

Bagasse—Continued

BAGASSE and bamboo for papermaking. Paper v, No. 12, 21 (Dec. 6, 1911).

BAGASSE as a papermaking material. Paper Making xxviii, No. 9, 359 (Sept., 1909).

BAGASSE as a raw material for paper. Papier-Ztg. xxxviii, No. 7, 209 (Jan. 23, 1913).

BAGASSE as a raw material for paper pulp. Science Industry i, No. 6, 334 (Oct., 1919).

BAGASSE as papermaking material. Paper Makers' Mo. J. xlii, No. 2, 47-48 (Feb. 15, 1904).

BAGASSE as raw material for papermaking. Papierfabr. ix, No. 16, 478-480 (Apr. 21, 1911); xiv, No. 2, 31 (1916).

BAGASSE for paper. Paper Mill xxxii, No. 5, 12 (Jan. 30, 1909).

BAGASSE: Its adaptability in the production of the best book and writing paper. World's Paper Trade Rev. xliii (July 8, Aug. 26, Sept. 16, 1904).

BAGASSE: Its utilization and treatment as a papermaking raw material. World's Paper Trade Rev. xliv, — (Aug. 25, Sept. 15, Oct. 13, 20, Nov. 10, 17, 1905); xlv, — (Feb. 9, Mar. 30, June 22, 1906).

BAGASSE makes a good white paper. Paper Makers' Mo J. xlvii, No. 1, 11-12 (Jan. 15, 1909).

BAGASSE or megass in papermaking. Paper Trade J. xlix, No. 22, 30, 32 (Nov. 25, 1909).

BAGASSE paper. Papier xiii, 27 (1910).

BAGASSE paper. Paper xviii, No. 19, 18 (July 19, 1916).

BAGASSE paper. Papeterie xli, 407-411 (Oct. 10, 1919); Paper xxv, 658.

BAUNARD, WALTER. Making money from bagasse. Sugar xxi, 122-123 (1919); C. A. xiii, 1028.

BLISS, H. Paper from sorghum. Paper Maker xli, No. 2, 229 (1911).

Brand, C. J., 1916.

BURTON, G. D. Treating sugar cane and similar substances. U. S. Patent 909,987. Jan. 19, 1909. J. Soc. Chem. Ind. xxviii, 257.

CARMODY, —. Paper from megass. Bull. Imp. Inst. viii, 151-152 (1910); J. Soc. Chem. Ind. xxix, 1053.

COMPANIA INDUSTRIAL de CELLULOSE. Transforming bagasse into paper pulp. French Patent 394,143. Aug. 8, 1908. Papier xii, 14 (1909); Papeterie xxxi, No. 3, 56 (1909); C. A. iv, 109; J. Soc. Chem. Ind. xxviii, 257.

Bagasse—Continued

CROWLEY, J. T. Position of bagasse in Cuba. Daily Consular and Trade Reports; Paper xv, No. 11, 30 (Nov. 25, 1914).

Dodge, C. R., 1897, page 78.

DREWSEN, VIGGO. Cornstalks and bagasse. The merits of these waste products as papermaking materials. Paper Trade J. xlviii, No. 5, 131-137 (Feb. 4, 1909); Paper Makers' Mo. J. xlvii, No. 4, 124-127 (Apr. 15, 1909).

DREWSEN, VIGGO. Cornstalks, sugar cane, and analogous pithy stalks. U. S. Patent 731,290. June 16, 1903. French Patent 344,692. July 9, 1904. English Patent 15,297. July 8, 1904. U. S. Patents 789,416, 789,417, 789,418. May 9, 1905; 798,887. Sept. 5, 1905; 853,943. May 14, 1907. J. Soc. Chem. Ind. xxii, 876; xxiv, 663, 1233; xxvi, 713.

Griffin and Little, page 132.

GUENTHER, R. Paper from bagasse. Monthly Consular and Trade Reports, May 13, 1908, No. 3175, page 8.

HALE, F. D. Megass and bamboo paper. Monthly Consular and Trade Reports, Dec. 1, 1909, No. 3649, page 11; also Mar. 20, 1911; Paper iii, No. 4, 20 (Apr. 11, 1911); World's Paper Trade Rev., May 31, 1912.

Hanausek, T. E., 1911.

Havik, 1911.

HAWAIIAN SUGAR PLANTER COMMITTEE. Manufacture of sugar and utilization of by-products. 1913.

HEIM, F., MAHEU, J., and MAHOD, L. Papermaking qualities of bagasse. Papeterie xlii, 539-543, 578-587 (June 25, July 10, 1920); Paper xxvii, No. 2, 11-14, 36 (Sept. 15, 1920); Bull. syndicat fabricants papier carton, France, No. 9, 135-136 (May 15, 1920); C. A. xiv, 2533, 2856.

Hofmann, 1897, 1641-1642.

HOFMANN, C. Sugar cane paper. Papier-Ztg. xxxvi, 2221-2222 (1911).

HUTCHINSON, T. J. Bagasse fiber. World's Paper Trade Rev. lvi, No. 22, 1022 (Dec. 1, 1911).

HUTCHINSON, T. J. Paper Makers' Mo. J. xlvii, No. 1, 10 (Jan. 15, 1909).

HUTCHINSON, T. J. Obtaining papermaking cellulose from bagasse. English Patents 20,266, 20,267, 20,268. Sept. 11, 1907. French Patent 394,670. Sept. 11, 1908. U. S. Patent 975,387. Nov. 8, 1910. C. A. iii, 1942; C. A. v, 785; J. Soc. Chem. Ind. xxviii, 105; Papeterie xxxi, No. 3, 55 (1919).

HUTCHINSON, T. J. Treating the fibrous papermaking content of bagasse. English Patent 23,655. Nov. 5, 1908. U. S.

Bagasse—Continued

Patent 1,003,606. Sept. 11, 1911. C. A. iv, 2203; v, 3190; J. Soc. Chem. Ind. xxviii, 208.

HUTCHINSON, T. J. Utilizing bagasse. Moniteur xlv, 99-100 (1909).

Juritz, page 87.

LAKE, H. H. Reducing fibrous vegetable materials to pulp. English Patent 7,774. Apr. 2, 1902. J. Soc. Chem. Ind. xxii, 646.

LAMARRE, LOUIS BERT de. Paper from bagasse. J. fabr. sucre 1, 31 (1909).

LAMARRE, LOUIS BERT de. Treatment of megass. English Patent 28,163. Dec. 24, 1908. C. A. iv, 2219; J. Soc. Chem. Ind. xxix, 147 (1910).

LEE, C. TENANT. Papermaking fibers from bagasse. U. S. Patent 1,155,741. Oct. 5, 1915. English Patent 17,834. July 28, 1914. C. A. ix, 3358; J. Soc. Chem. Ind. xxxiv, 606.

LEE, C. TENANT. Treatment of vegetable fibers. French Patent 345,632. Aug. 4, 1904. J. Soc. Chem. Ind. xxiv, 40.

LEE, C. TENANT, and MONKS, A. B. Paper pulp from lixiviated sugar cane. U. S. Patent 1,153,934. Sept. 21, 1915. C. A. ix, 3130.

LEVY, N. Employment of the bagasse in the manufacture of paper. Bull. assoc. chim. sucr. dist. xix, No. 1-2, 215-217 (1901); Expt. Sta. Rec. xiii, 597.

Lightfoot, Bull. 11, page 33.

Liotard.

LITTLE, ARTHUR D., Inc. Papermaking qualities of Hawaiian bagasse. Expt. Station Hawaiian Sugar Planters' Association. Bull. 46. 51 pp. 1919; C. A. xiv, 121.

LITTLE, ARTHUR D., Inc. Samples of paper made from sugar cane fiber, prepared by the Simmons Process. 57 pp. 1913. Papier-Ztg. xxxviii, No. 68, 2515.

LOPEZ de la CAMARA, M. and EGANA, F. R. Manufacture of paper, etc., from bagasse and other vegetable refuse. English Patent 20,575. Sept. 20, 1902. French Patent 324,599. Sept. 18, 1902. J. Soc. Chem. Ind. xxii, 569.

McMULLEN, G. W. Paper from sugar cane. Paper Trade J. lv, No. 25, 48 (Dec. 19, 1912); Paper Makers' Mo. J. li, 81 (Jan. 15, 1913); World's Paper Trade Rev. lix, No. 4, 168.

McMULLEN, G. W. Sugar cane as stock. Paper Makers' Mo. J. xlviii, No. 7, 248 (July 15, 1910).

McRAE, W. A. R. M. Half stuff, paper pulp, or paper. U. S. Patent 1,151,490. Aug. 24, 1915. Paper xvii, No. 2, 17-18

Bagasse—Continued

(Sept. 22, 1915); World's Paper Trade Rev. lxiv, No. 18, 716-717 (Oct. 29, 1915); C. A. ix, 2980.

McRAE, W. A. R. M., and MALCOLMSON, N. Paper from megass. English Patent 26,043. June 26, 1911. J. Soc. Chem. Ind. xxxi, 769.

MANUFACTURE of paper from sugar cane bagasse. J. Roy. Soc. Arts lxiv, 132 (Dec. 31, 1915); J. Soc. Chem. Ind. xxxv, 39.

MARSDEN, M. W. Glucose and paper fiber from bagasse. U. S. Patent 1,265,694. May 7, 1918. Paper xxiii, 231; Pulp Paper Mag. Can. xvi, 959; C. A. xii, 1709.

MARSDEN, M. W. Utilizing bagasse. U. S. Patent 1,170,487. Feb. 1, 1916. C. A. x, 985.

MARSHALL, G. H. Reducing fiber-yielding materials. U. S. Patent 971,457. Sept. 27, 1910. U. S. Patent 982,379. June 24, 1911. C. A. iv, 3298; v, 1188.

MEGASS. Paper Making xxvii, No. 9, 337-338 (Sept., 1908).

MEGASS for papermaking. Agr. News xviii, 205 (June 28, 1919).

MILLER, WARNER. Rice straw and bagasse for paper pulp. Paper xx, No. 20, 24 (July 25, 1917).

NOBLE, G. R. More about cornstalks and bagasse. Pulp Paper Mag. Can. vii, No. 7, 218-219 (Aug., 1909); World's Paper Trade Rev. 1, No. 24, 1004-1005 (1909).

OKAZAKI, U. Composition of pulp. U. S. Patent 1,278,199. Oct. 9, 1918. J. Soc. Chem. Ind. xxviii, 764A.

PAPER from bagasse. World's Paper Trade Rev. li, No. 4, 12 (1909); liii, No. 20, 862 (1910).

PAPER from bagasse. Am. Sugar Ind., Sept., 1911, 399.

PAPER from bagasse. Papier-Ztg. xxviii, 2891; J. Soc. Chem. Ind. xxii, 1145.

PAPER from bagasse. Papier-Ztg. xliii, No. 37, 827 (1918).

PAPER from bagasse. Chim. ind. ii, 537 (1919); Paper xxiv, 712.

PAPER from bagasse. Centr. Zuckerind. xxi, 376 (1912).

PAPER from sorghum. Paper Makers' Mo. J. xl, No. 1, 11 (Jan. 15, 1902).

PAPER from sugar cane. Papier-Ztg. xxxviii, No. 92, 3399 (Nov. 16, 1913).

PAPER from sugar cane bagasse. Paper Maker 1, No. 4, 409 (Oct. 1, 1915).

PAPERMAKING from megass. Paper Maker lvii, No. 2, 152 (Feb. 1, 1919).

Bagasse—Continued.

PAPERMAKING prospects in Egypt. Paper xxv, 131, 371 (Sept. 10, Oct. 22, 1919).

PEMBERTON, H. Manufacture of paper from sorghum. U. S. Patent 38,059. Mar. 31, 1863.

Phillips, S. C., 1915, page 257.

VON POSSANNER, ——. Bagasse as a papermaking material. Wochbl. Papierfabr. xlii, No. 13, 1157-1158 (1911); C. A. v, 2945; J. Soc. Chem. Ind. xxx, 483.

PRINSEN-GEERLIGS, H. C. Paper from bagasse. J. fabr. sucre 1, 7 (1909); Chem.-Ztg. 1909, 164; Papier xii, 12 (1909); Papier-Ztg. xxxiv, 1644 (1909).

PRINSEN-GEERLIGS, H. C. Sugar cane bagasse as a material for the manufacture of paper. Centr. Zuckerind. xvii, 12 (1908); C. A. iii, 117.

PROGRESS of papermaking from bagasse. Paper vii, No. 8, 29 (May 8, 1912).

PULP from bagasse in South. Paper Trade J. lxv, No. 3 10 (July 19, 1917).

RAITT, G. Manufacture of paper from bagasse. Rev. ind. agr. Tucumán i, No. 12, 38-41; C. A. v, 3154.

RAITT, WM. Bagasse as a papermaking material. Tropical Agriculturist xxxiv, No. 1, 11-12 (1910); World's Paper Trade Rev. liii, 968-969 (1910); Paper Maker xl, 64-65 (1910); Papierfebr. viii, 665-666 (1910); C. A. v, 196; J. Soc. Chem. Ind. xxix, 1003.

RAITT, WM. Profit in using bagasse. Paper Makers' Mo. J. xlviii, No. 7, 247-248 (July 15, 1910).

RAW material for the manufacture of half stuff and paper in Java. Papierfabr. ix, 245, 274 (1911); Paper iv, No. 12, 9-12 (Sept. 6, 1911).

REMINGTON, J. S., BOWAK, D. A., and CARRINGTON, A. J. B. Megass in papermaking. World's Paper Trade Rev. lii, No. 18, 729-731 (Oct. 29, 1909); Aynsome Annual ii, 80-89 (1910); Papierfabr. viii, No. 47, 1185-1187 (Nov. 26, 1909); C. A. iv, 826; J. Soc. Chem. Ind. xxix, 16.

SELLEGER, E. L. Bagasse. Wochbl. Papierfabr.; Paper Makers' Mo. J. xlv, No. 3, 101 (Mar. 15, 1907); Paper Trade J. xliv, No. 1, 52 (Jan. 3, 1907).

SIMMONDS SUGAR CO. Paper from sugar cane. German Patent 261,998. June 6, 1910. Z. angew. Chem. 1913, No. 70, 541; Papierfabr. xi, 339 (1913).

SMITH, B. C. Making cane hemp for making paper. U. S. Patent 3,349. Nov. 21, 1843.

SORGHUM as papermaking material. Paper xxii, No. 1, 17 (Mar. 13, 1918).

Bagasse—Continued.

SUGAR CANE BY-PRODUCTS CO. Turning waste into wealth. 28 pp. 1918.

SUGAR cane for paper. Paper Making xxxiv, No. 12, 379.

SUGAR cane paper. Papier-Ztg. xxxvi, 2221-2222 (July 30, 1911); C. A. v, 3621.

SUGAR cane paper. Papier-Ztg. xli, No. 52, 967; No. 81, 1566 (1916).

SUGAR cane refuse for papermaking. Papier-Ztg. xxxviii, No. 7, 209 (1913).

THIELE, F. C. Manufacture of paper from sugar cane refuse. Chem.-Ztg. xxv, No. 27, 289-290 (1901); J. Soc. Chem. Ind. xx, 495; Expt. Sta. Rec. xiii, 597.

TO MAKE paper from bagasse. Manufacturers Record, May 17, 1917, page 58.

UNFAVORABLE opinion on bagasse. Paper Makers' Mo. J. xlvii, No. 9, 310 (Sept. 15, 1909).

UTILIZATION of bagasse and sugar. Intern. Sugar J. xvi, 378-382; C. A. viii, 3729.

WALLACE, JOSEPH H. Possibilities of bagasse for papermaking. Paper xxiv, No. 12, 451-452 (May 28, 1919); Sugar xxi, 233-234; C. A. xiii, 1545, 1763; Paper Mill xlii, No. 24, 5 (1919); Paper Maker lix, No. 4, 487-488 (Apr. 1, 1920).

WEST, CLARENCE JAY. History of bagasse for papermaking. Paper Trade J. lxx, No. 21, 52, 54 (May 20, 1920).

WEST, CLARENCE JAY. Paper from bagasse. Tech Eng. News i, No. 1, 1-3 (Feb., 1920); Paper xxv, No. 2, 26, 28 (Mar. 17, 1920); Sci. Am. Monthly i, No. 3, 283 (Mar., 1920).

WILSON, EDWARD. Megass as paper material. World's Paper Trade Rev. lix, No. 5, 238 (1913).

WREDE, HANS. Bagasse in Cuba. Papierfabr. ix, 1029-1034 (1911); World's Paper Trade Rev. lvi, No. 3, 112; No. 11, 484 (July 21, Sept. 15, 1911); Paper iv, No. 3, 9-11 (July 5, 1911); Paper Making xxx, No. 10, 374, 376 (Oct., 1911); Chem.-Ztg. xxxvi, 205-206 (1912); C. A. vi, 422.

WREDE HANS. Utilization for papermaking of bagasse and other West Indian fibers. Wochbl. Papierfabr. xlii, 582-584 (1911); C. A. v, 3154; J. Soc. Chem. Ind. xxx, 278.

Bahia piassaba. See *Attalea funifera.*

Baib. See *Ischaemum angustifolium.*

Baldengera arundinacia. Ftomenteau.
Davis.

Balizier. See *Heliconia bihai.*

Bamboo. *Bambusa.*

ANDERSON, C. E. Commercial notes on bamboo pulp. Daily Consular and Trade Reports, Sept. 3, 1913, page 1290; Paper xii, No. 12, 19 (Sept. 3, 1913); Paper Maker lvi, No. 4, 602 (Oct. 1, 1913); World's Paper Trade Rev. lx, No. 14, 680 (Oct. 3, 1913).

ANDERSON, C. E. Paper pulp from bamboo. Paper Makers' Mo. J. lii, 277-278 (Aug. 15, 1914).

BAKER, HENRY D. Manufacture of paper from bamboo in Trinidad. Commerce Reports, Mar. 9, 1918, No. 57, 898.

BAMBOO. Paper Makers' Mo. J. li, 54-55 (Feb. 15, 1913).

BAMBOO and Savannah grasses as papermaking materials. Paper Maker lvii, No. 3, 288 (Mar. 1, 1919); Paper xxiv, No. 8, 264 (Apr. 30, 1919).

BAMBOO as a source of pulp. Agr. News xiv, No. 338, 127 (Apr. 10, 1915); Paper Maker 1, No. 4, 404-405 (Oct. 1, 1915); Pulp Paper Mag. Can. xiii, No. 22, 583 (Oct. 15, 1915).

BAMBOO cellulose. Wochbl. Papierfabr. xliv, 3521-3522 (1913).

BAMBOO fiber. Paper Mill xxv, No. 33, 26 (Aug. 16, 1902).

BAMBOO for papermaking. Paper Trade J. xxix, No. 8, 242 (July 20, 1899).

BAMBOO for paper pulp. Paper Making xxx, No. 3, 105-106 (Mar., 1911).

BAMBOO paper. Paper Making xxxii, No. 5, 190-192.

BAMBOO paper pulp. Indian Engineering liii, No. 13, 180-181.

BAMBOO paper pulp. Indian Power x, No. 12, 549-553 (1913).

BAMBOO pulp. Paper Trade Rev. lxii, No. 17, 1-2.

BAMBOO pulp. Sci. Am. Suppl. lxix, 157 (Mar. 5, 1910).

BAMBOO pulp the future papermaking material. Paper Makers' Mo. J. xlix, No. 8, 265-266 (Aug. 15, 1911).

Beadle and Stevens, 1913.

BLEACHING of bamboo. World's Paper Trade Rev. li, No. 76, 716 (1909); C. A. iii, 1590.

Boomer, 1919.

DAVIDSON, J. W. Paper in Formosa: How it is manufactured from small bamboo and paper mulberry. Paper Mill, Feb. 22, 1902, page 28; Paper Makers' Mo. J. xl, No. 3, 83-84 (Mar. 15, 1902).

EKMAN, C. D. Bamboo pulp. Wochbl. Papierfabr. xxxv, 461-462 (1904); J. Soc. Chem. Ind. xxiii, 265.

Bamboo—Continued.

ENGEL, C. Bamboo paper in Tonkin. Paper Makers' Mo. J. li, 51 (Feb. 15, 1913).

EXTRACTING cellulose from bamboo. World's Paper Trade Rev. lxvi, No. 16, 8-9.

HALE, FRANKLIN D. Bamboo. Paper iii, No. 4, 20 (Apr. 11, 1911).

Hanausek, T. E., 1912.

Hofmann, 1897, page 1641.

Hübner, 1903, page 17.

INDIAN forest products. Paper Maker liii, 417-421 (May 1, 1917).

INDIAN paper pulp. Indian Planters' Gazette; Paper Makers' Mo. J. lii, 95 (Mar. 16, 1914).

Janvier, 1919.

JARDINE, J. L. Paper pulp or fiber from bamboo. English Patent 18,371. Aug. 13, 1913. Canadian Patent 160,045. Jan. 12, 1915. U. S. Patent 1,143,401. June 15, 1915. J. Soc. Chem. Ind. xxxiii, 1006; Paper xv, No. 10, 23 (Nov. 18, 1914); Pulp Paper Mag. Can. xii, No. 22, 653-654 (Nov. 15, 1914); Paper xvi, No. 18, 15-16 (July 14, 1915); Paper Maker xlviii, No. 4, 679 (Nov. 2, 1914); World's Paper Trade Rev. lxiii, No. 24, 972-973 (June 11, 1915); C. A. ix, 377, 1246, 2311.

JARDINE, J. L., and NELSON, T. A. Preparation of bamboo. English Patent 14,421. June 16, 1914. C. A. ix, 3359.

JARDINE, J. L., and NELSON, T. A. Preparing bamboo and kindred materials for pulp extraction, etc. English Patent 137,347. Jan. 15, 1920. Paper Maker lix, No. 4, 467 (Apr. 1, 1920).

JARDINE, J. L., and NELSON, T. A. Process for making pulp from bamboo. French Patent 475,981. June 27, 1915. Papier xxii, 88 (1919); Paper xxiv, No. 16, 712 (June 25, 1919).

Juritz, page 67.

KAINDLER, ——. Bamboo and pousolsia for papermaking. Moniteur; Paper Making xxv, 522-523 (1906); J. Soc. Chem. Ind. xxv, 1114.

Knösel, 1909.

Lightfoot, Bull. 11, page 32.

Liotard, page 69.

LITTLE, ARTHUR D. New source of paper stock. Chem. Eng. vii, 106 (Mar., 1908).

Little, 1910.

McGREGOR, R. C. Bamboo for paper pulp in Balaan Province, Luzon. Philipp. J. Sci. vii, 121-123 (Apr., 1912).

Bamboo—Continued.

McRAE, W. A. R. M., and MALCOLMSON, N. Half stuff or pulp from bamboo. English Patent 14,871. June 26, 1911. World's Paper Trade Rev. lviii, No. 7, 313 (Aug. 16, 1912); C. A. vii, 252; J. Soc. Chem. Ind. xxxi, 769.

MAKING pulp from bamboo. Paper Trade J. lix, No. 19, 24 (Nov. 5, 1914).

MAKING pulp from bamboo. Paper Trade J. xlix, No. 8, 48 (Aug. 19, 1909).

MANUFACTURE of bamboo pulp. Paper Maker xlvi, No. 4, 602.

MANUFACTURE of paper pulp from bamboo in the Far East. J. Roy. Soc. Arts lxii, 196-197 (Jan. 23, 1914); C. A. viii, 1345.

MARUZAWA, T. Paper pulp. Japanese Patent 31,675. Oct. 27, 1917. U. S. Patent 1,244,525. Oct. 30, 1917. C. A. xii, 224, 1252.

MASILAMANY, T. P. Papermaking in Ceylon. Paper Making xxx, No. 8, 301 (1911).

MEGASS bamboo pulp. Paper Making xxx, No. 6, 224 (June, 1911).

MICHAEL, W. H. India's bamboo experiments. Monthly Consular and Trade Reports, Sept. 6, 1907.

MILNE, SAMUEL. Pulp from bamboo. World's Paper Trade Rev. lvi, No. 15, 679-681 (Oct. 13, 1911).

Montessus de Ballore, page 189.

MONTESSUS de BALLORE, ——. Bamboo as a remedy for deforestation. Moniteur; Paper v, No. 3, 12 (Oct. 4, 1911).

NIGHTINGALE, ——. Papermaking in China. World's Paper Trade Rev. lv, No. 4, 182 (Jan. 27, 1911).

Norton, 1910, I.

PAPER and pulp in Indo-China. Paper Maker 1, No. 6 612 (Dec. 1, 1915).

PAPER from bamboo. Papier-Ztg. xxxi, No. 44, 1830; No. 54, 2240 (June 3, July 8, 1906).

PAPER from bamboo. Papier-Ztg. xxxviii, 2806-2807 (Sept. 21, 1913).

PAPER from bamboo. World's Paper Trade Rev., Oct. 13, 1911, 7-9.

PAPER from bamboo. Paper Makers' Mo. J. lvi, 265 (Sept. 16, 1918).

PAPER of bamboo pulp. Paper Makers' Mo. J. xlviii, No. 3, 86 (Mar. 15, 1910).

PAPER pulp from bamboo. Sci. Am. Suppl. lxiv, 11 (July 6, 1907).

Bamboo—Continued.

PAPERMAKING in China. Paper Trade J. xxix, No. 14, 430 (Aug. 31, 1899).

PEARSON, R. S. Bamboo cellulose. Papier-Ztg. xxxviii, No. 76, 2806 (1913); C. A. viii, 246.

PEARSON, R. S. Bamboo for the manufacture of paper pulp. World's Paper Trade Rev. lx, No. 11, 1-10.

PEARSON, R. S. Recent industrial and economic developments of Indian forest products. Paper Makers' Mo. J. lv, 144-145 (May 15, 1917).

PEARSON, R. S. The utilization of bamboo for the manufacture of paper pulp. Indian Forest Records iv, No. 5, part v, 121 pp. (1912); Bull. Imp. Inst. xi, 352 (1913); World's Paper Trade Rev. lx, No. 11, 485-494 (Sept. 12, 1913); Expt. Sta. Rec. xxix, 645.

Phillips, S. C., 1915, page 143.

PRODUCTION of chemical fibers from jute, manila, bamboo, etc. World's Paper Trade Rev. lxviii, No. 18, 722.

PULP for the whole world in India. Paper xxiv, No. 13, 489 (June 4, 1919).

RAITT, WM. Bamboo. Indian Forester xxxvi, 34 (1910).

RAITT, WM. Bamboo as a papermaking material. World's Paper Trade Rev. xlviii, No. 13, 497-502 (Sept. 27, 1907); Paper Making xxvi, No. 11, 502-508; No. 12, 539-541 (1907); Paper Trade J. xlv, No. 16, 40, 44, 46, 50 (Oct. 17, 1907); C. A. ii, 585; J. Soc. Chem. Ind. xxvii, 35; Expt. Sta. Rec. xx, 50.

RAITT, WM. Bamboo as a papermaking material. Indian Forest Records iii, part 3, 39 pp. (1912); Paper viii, No. 3, 17-18 (July 3, 1912); World's Paper Trade Rev. lviii, No. 8, 369-373; No. 9, 413-420; No. 10, 466-470; No. 11, 515-517; No. 12, 566-568; No. 13, 614-618 (Aug. 23-Sept. 27, 1912); C. A. vi, 2527; J. Soc. Chem. Ind. xxxi, 1025; Expt. Sta. Rec. xxvii, 647; Papier-Ztg. xxxvii, 2687, 3199; Papierfabr. x, 1471.

RAITT, WM. Bamboo cellulose. 8th Intern. Cong. Appl. Chem. xiii, 219-232 (1912); xxvii, 115 (1912); Paper ix, No. 1, 22-25, 29 (Sept. 18, 1912); Paper Maker, Annual No., 1912-1913, 287-294; C. A. vi, 3014; J. Soc. Chem. Ind. xxxi, 870.

RAITT, WM. Cellulose in India. Paper Trade J. lxviii, No. 1, 46-52 (1919); C. A. viii, 1203.

RAITT, WM. Extracting cellulose from bamboo. World's Paper Trade Rev. lxvi, No. 17, 724-725 (Oct. 27, 1916); Paper xix, No. 15, 18-19 (Dec. 20, 1916).

RAITT, WM. Forest economics of bamboo. World's Paper Trade Rev. lviii, No. 1, 1-2 (July 5, 1912).

Bamboo—Continued.

RAITT, WM. Indian fibers for Indian papers. Paper Makers' Mo. J. li, 149 (Apr. 15, 1913).

RAITT, WM. Isolating or extracting cellulose or paper pulp from fibrous materials. English Patent 15,779. 1912. Paper Maker xlvi, No. 2, 253 (Aug. 1, 1913).

RAITT, WM. More about bamboo pulp. World's Paper Trade Rev. xlix, No. —— (June 26, 1908); Paper Making xxviii, No. 10, 387-388 (Oct., 1909); Paper Trade J. xlvii, No. 2, 42 (July 9, 1908); C. A. iii, 3009.

RAITT, WM. Treating bamboo for the digester in the manufacture of paper pulp. English Patent 6,954. Mar. 21, 1912. C. A. vii, 3025.

RAYNER, G. H. Preparation of paper pulp. French Patent 453,307, Nov. 29, 1912. Moniteur xlix, No. 13, 301 (1913); C. A. vii, 4069; J. Soc. Chem. Ind. xxxii, 785.

REAT, S. C. Paper from Formosa bamboo. Paper Makers' Mo. J. xlviii, No. 2, 51 (Feb. 15, 1910).

REPORT on bamboo pulp from the Molo district. Paper Maker xlvi, No. 4, 590 (Oct. 1, 1913).

Richmond, G. F., 1907, 1911.

RICHMOND, G. F. Bamboo for paper pulp. World's Paper Trade Rev. lv, No. 11, 488 (Mar. 17, 1911); Paper Making xxx, 105 (1911).

ROUTLEDGE, THOMAS. Bamboo and its treatment. 1879.

ROUTLEDGE, THOMAS. Bamboo considered as a paper-making material, with remarks upon its cultivation and treatment. London: E. and F. M. Spon. 1875. 40 pp. 8°.

SCHMIDT, E. Bamboo cellulose. Wochbl. Papierfabr. xliv, No. 37, 3521-3522 (1913); C. A. viii, 246.

SCOTT, JAMES. The pulping of bamboo. Paper Maker xlvii, No. 5, 731-734 (May 1, 1914); Paper Maker, Intern. No., 1914-1915, 127-130; Paper Trade J. lvii, No. 25, 42, 44, 46, 48 (June 18, 1914); Paper xiv, No. 15, 16-19 (June 24, 1914); C. A. viii, 2619.

SEMBRITZKI, W. Bamboo cellulose. Papier-Ztg. xxxiv, 808 (1909).

Setlik, B., 1907.

SINDALL, ROBERT W. Bamboo for papermaking. London: Marchant, Singer and Co. 1909. 60 pp. 8°. (Printed on bamboo paper.) Re-issued in 1913, with notes by J. Bertram and Son, Ltd.

SINDALL, ROBERT W. Making paper from bamboo. Paper Trade J. xlix, No. 8, 48 (Aug. 19, 1909).

Bamboo—Continued.

SINDALL, ROBERT W. Paper from bamboo pulp. **Paper** Maker xxviii, 864 (1909); **Papier-Ztg. xxxiv, 3287-3288** (1909); Wochbl. Papierfabr. xl, 2662 (1909).

SINDALL, ROBERT W. Report on the manufacture of paper and paper pulp in Burma. Prepared by order of the Government of India. Ragoon. Office of supt. govt. printing, Nov., 1906. 36 pp. Maps.

TREATMENT of bamboo pulp. **World's Paper Trade** Rev., Aug. 6, 1909.

TROPICAL grasses as papermaking materials. **Bull. Imp.** Inst. xvi, No. 3, 271-275 (1918); **Paper Maker, Intern. No.,** 1918-1919, 45; C. A. xiii, 789.

TURNER, J. S., and MAXWELL, A. W. **Treatment of** bamboo pulp and other similar materials. **English Patent** 6,277. Mar. 20, 1908. French Patent 401,035. **Mar. 19, 1909.** J. Soc. Chem. Ind. xxviii, 851; **Paper Making xxviii, No. 8,** 316 (Aug., 1909); Moniteur xlv, 393-395 (1909).

U. S., Bureau of Foreign Commerce.

USE of bamboo pulp for paper. **Monthly Commerce and** Trade Reports, Oct., 1907.

USE of bamboo in the manufacture of **paper. Bull. soc.** for. Belg. xvii, 355-356 (May, 1910).

VINCENT, HARRY. Bamboo for paper **pulp. Am. For**estry xvii, 343-347 (June, 1911); Paper iv, No. **7, 9-10 (Aug.** 2, 1911); World's Paper Trade Rev. lvi, No. 6, **282 (Aug. 11,** 1911); Paper Trade J. liii, No. 2, 54 (1911); **Paper Makers'** Mo. J. xlix, No. 8, 265-266 (1912).

Watt, vol. I, page 378; vol. VI, part 1, page 107.

WHITE, JOHN, and BERTRAM, J. H. Bamboo **paper** pulp. World's Paper Trade Rev. lx, No. **9, 388-389 (Aug. 29,** 1913).

Bamboo grass.

TROPICAL grasses as papermaking materials. **Bull. Imp.** Inst. xvi, No. 3, 273-275 (1918).

Bamboo palm. See *Raphia vinifera.*

Bambusa apus.

Havik, 1912.

Bambusa arundinacea. Bamboo. Spiny bamboo of **Central** India.

Cross, Bevan, and King, page 49.

Dodge, C. R., 1897, page 79.

Kirchner, vol. II, page 58.

Pearson, 1917.

Raitt, 1912. Reference under bamboo.

Spon, vol. I, page 920.

Bambusa audong.
Havik, 1912.

Bambusa balcoosa. Female bamboo.
Cross, Bevan, and King, page 49.

Bambusa bambusoides.
Pearson, 1917.

Bambusa blumeana. Structural bamboo.
Boomer, 1919.
Richmond, 1906.

Bambusa brandisii.
Cross, Bevan, and King, page 49.

Bambusa ceiba.
Piette, 1861.

Bambusa lumampao. Dwarf bamboo.
Dwarf bamboo as a papermaking material. Agr. News xix, 277 (Sept. 4, 1920).
Boomer, 1919.
Richmond, 1906.

Bambusa pergacile.
Pearson, 1917.

Bambusa polymorpha.
Pearson, 1917.
Raitt, 1912.

Bambusa spinosa. Spiny bamboo.
Brown and Fischer, Bull. 15.

Bambusa thouarsii. See *Bambusa vulgaris.*

Bambusa tulda. Common bamboo of Bengal.
Cross, Bevan, and King, page 49.
Pearson, 1917.
Raitt, 1912.

Bambusa vulgaris. Yellow and green striped bamboo.
Cross, Bevan, and King, page 49.
Griffin and Little, page 132.
Routledge, 1875.
Watt, vol. I, 393.

Banana. See *Musa sapientum.*

Banyan tree. See *Ficus benghalensis.*

Baobab. See *Adansonia digitata.*

BARBILLON, M.
Possibilities of new fibers for pulp and papermaking. Paper xxvi, No. 21, 11-12 (July 28, 1920).

Bark.
ALLEN, S. M. Paper pulp. U. S. Patent 253,656. Feb. 14, 1882. J. Soc. Chem Ind. i, 116.

HALL, C. C. Preparation of paper from resinous bark. U. S. Patent 12,414. Feb. 20, 1855.

Bark—Continued.

HUNT, W. H. Making paper from bark in Madagascar. Consular Reports lxviii, 36-38 (Jan., 1902).

KRESS, OTTO. Use of barks for paper specialties. Paper xix, No. 4, 15-17 (Oct. 4, 1916); J. Ind. Eng. Chem. viii, 883-886 (Oct., 1916); Pulp Paper Mag. Can. xiv, No. 19, 333-335 (Oct. 1, 1916); Paper Mill xxxix, No. 40, 2, 38 (Sept. 30, 1916); C. A. xi, 99; J. Soc. Chem. Ind. xxxv, 1105.

Munsell, page 56.

Remington, J. B. See reference under *Adansonia*.

SIMPSON, H. J., and MACKUDY, G. deM. Manufacture of cellulose or wood pulp from a certain tree bark and wood (red wood). English Patent 8,817. June 18, 1887. J. Soc. Chem. Ind. vii, 451.

WORKING up bark waste of coniferous woods into strong paper. Wochbl. Papierfabr. xxxix, 3133-3135 (Sept. 12, 1908); C. A. iii, 3404.

Barley. See *Hordeum vulgare*.

Barriala. See *Sida rhombifolia*.

Bassia longifolia. Mahua tree. Mohiva. Mowa.

Dodge, C. R., 1897, page 81.

Liotard.

Bastard aloe. See *Agave vivipara*.

Bastard cedar. See *Guazuma ulmifolia*.

Bauhinia racemosa. Malloo climber.

Dodge, C. R., 1897, page 81.

Hooper, 1909-1910.

Liotard, page 17.

Mierzinski, page 16.

Mueller, L., 1877.

Watt, vol. I, page 422.

Bauhinia vahlii. The gigantic climber.

BRASIER, E. Treating Bauhinia vahlii. English Patent 7,350. May 17, 1888. J. Soc. Chem. Ind. viii, 565.

Bull. Misc. Inform., Kew., Sept. 4, 1887, page 19; Selected Papers, I, page 274.

Cross, Bevan, and King, page 49.

Dodge, C. R., 1897, page 81.

Watt, vol. I, page 424.

Beach grass. See *Ammophilis arenaria*.

BEADLE, CLAYTON.

Course of lectures on paper manufacture. Dickinson Institute, Croxley Green. Oct., Dec., 1901.

BEADLE, CLAYTON.

Fibrous constituents of paper. Paper Maker xxxiii, 422-424, 597-601, 724-729; xxxiv, 4-5, 159-163 (Apr.-Aug., 1907); C. A. ii, 177.

BEADLE, CLAYTON.

Personal review of attempts to utilize fibers for papermaking. Pulp Paper Mag. Can. xii, No. 8, 251-252 (Apr. 15, 1914).

BEADLE, CLAYTON.

The cost of transport of bulky fibers as a lesson to fiber enthusiasts. World's Paper Trade Rev. xlviii, 210-211 (Aug., 1907); C. A. ii, 180.

BEADLE, CLAYTON and STEVENS, HENRY P.

The ginger plant order and its value for papermaking. Bull. Misc. Inform., Kew, 1912, No. 9, 373-378; J. Soc. Chem. Ind. xxxii, No. 6, 259-260 (1913); Paper xi, No. 6, 17-18 (Apr. 23, 1913); Paper Trade Rev. lix, No. 21, 1-3; C. A. vii, 889, 2306.

BEADLE, CLAYTON and STEVENS, HENRY P.

New sources of supply for the manufacture of paper. J. Roy. Soc. Arts lxi, 347-363 (1913); Paper Maker, Intern. No., 1912-1913, 114-124; Paper x, No. 12, 21-23 (Mar. 5, 1913); Pulp Paper Mag. Can. xi, No. 6, 185-187 (Mar. 15, 1913); C. A. vii, 1970; J. Soc. Chem. Ind. xxxii, 228.

Bean. See *Phaseolus.*

Bear grass. See *Yucca filamentosa.*

Beesha travancorica. Eta.

MASILAMANY, T. P. Papermaking in Ceylon. Paper Making xxx, No. 8, 301 (1911).

Raitt, 1909.

Beet. See *Beta vulgaris.*

Begoniacea. Begonia.

Davis.

Bent grass. See *Ammophila arenaria.*

Beta vulgaris. Beet. Mangel-wurzel.

Archer, 1876.

COLLYER, R. H. Preparing paper pulp from beet and other refuse. U. S. Patent 18,839. Oct. 13, 1857.

LECLERC, G., and CARRE, P. Preparation of cellulose from the pulpy residue of beet roots and other roots. French Patent 406,006. Nov. 28, 1908. C. A. v, 1678; J. Soc. Chem. Ind. xxix, 416.

LeNormand.

Lindsay, 1858.

Mueller, L., 1877.

PAPER from beet pulp not profitable. Paper i, No. 5, 14 (Oct. 26, 1910).

Betel-nut palm. See *Areca catechu.*

Betula bhojpattra. Indian paper birch. Bhurja. Indian birch tree.

Dodge, C. R., 1897, page 83.

Watt, vol. I, page 452.

Bhaboi grass. See *Ischaemum angustifolium.*
Bhabur grass. See *Ischaemum angustifolium.*
Bhendi. See *Hisbiscus esculentus.*
Bhindi. See *Hisbiscus esculentus.*
Bhurja. See *Betula bhojpattra.*
Bingo-i. See *Juncus effusus.*
"Bizuagos mamillari."
Strother, 1883.
Black bay tree. See *Xanthorrhoea preissii.*
Black moss. See *Tilliandsia usncoides.*
Black reed. See *Cladium radula.*
See *Gahnia radula.*
Blady grass.
BLADY grass for paper pulp. Paper xxii, 529 (July 17, 1918).
BLADY grass as a new source of pulp. Paper xxv, 596 (Nov. 19, 1919).
BLEEKRODE, S.
Grondstoffen vóor papier-bereiding bizonder in Nèerlandsch-Indie. Delf (1859 ?). 36 p. 8°.
Raw materials for papermaking, especially in the Dutch Indies.
Blue cabbage. See *Brassica.*
Blue flag. See *Elodium caerulem.*
Iris versicolor.
Blue grass. See *Poa pratensis.*
Blue moor grass. See *Molinia coerulea.*
Bodolu sutta. See *Pederia foetida.*
Boehmeria. Stingless nettle. Phyba?
Dodge, C. R., 1897, page 85.
Lindsay, 1858.
Royle, 1855, page 392.
Schaeffer, 1772.
SCHWARZ, R. A new raw material for textile industry (nettle fiber). Wochenschr. niederösterr. Gewerbe Vereins lxx, 550 (1909); Oesterr. Chem.-Ztg. xiii, 4 (1910); Chem.-Ztg., Rpt., 1910, 75.
Boehmeria nivea. China grass. Ramie. Rhea.
ARANDON, J. Treatment of ramie. Mon. sci., 1890, 401-402; J. Soc. Chem. Ind. ix, 760.
Cross and Bevan, page 104.
Dodge, C. R., 1897, page 85.
Griffin and Little, page 128.
Kirchner, vol. II, page 75.
Lindsay, 1858.
Liotard.
Mierzinski, page 30.

Boehmeria nivea—Continued.

RAMIE for paper. Pulp Paper Mag. Can. i, 99-100 (Aug., 1903).

RAMIE paper. Paper Making xxvii, No. 4, 150-151 (Apr., 1908).

RHEA or China grass. Bull. Imp. Inst.; Paper Makers' Mo. J. xliii, No. 7, 236-237 (July 15, 1905).

SAMPSON, F. J. H. Treatment of rhea to obtain fiber. English Patent 17,462. Oct. 15, 1891. J. Soc. Chem. Ind. xi, 935.

SCOTT, JAMES. China grass or ramie fiber. Paper xii, No. 3, 19-20 (July 2, 1913).

Spon, vol. 1, page 921.

Watt, vol. I, page 468; vol. VI, part 1, page 444.

Boehmeria plantifolia.

Rein.

Boehmeria tenacissima.

Griffin and Little, page 127.

Bombax.

BOMBAX, its use as paper pulp. Paper Mill, Feb. 21, 1914, page 144.

Bombax ceiba. Ceiba.

MELL, C. D. The ceiba tree. Paper Trade J. lvi, No. 1, 54 (Jan. 2, 1913); Paper Makers' Mo J. li, 69-70 (Feb. 15, 1913).

Bombax heterophylia.

Liotard.

Bombax malabaricum. Red silk cotton. Indian cotton wood. Silk cotton tree.

Dodge, C. R., 1897, page 91.

HERZBERG, W. Pulp woods from the Cameroons. Papierfabr. ix, No. 914-917, 948-950 (1911); C. A. vi, 3517, Watt, vol. I, page 489.

Bombay hemp.

Mierzinski, page 25.

Bonapartea juncoidea.

Van den Corput.

Bon-dheuras. See *Hibiscus ficulneus.*

BOOMER, J. F. Papermaking materials in the Philippines. Commerce Reports, Aug. 31, 1919, No. 178, 632-649; Paper xxiv, No. 22, 980-982; No. 24, 1076-1080; No. 25, 1105 (Aug. 6, Aug. 20, Aug. 27, 1919); Paper Trade J. lxix, No. 5, 32, 34, 36; No. 6, 50, 60; No. 7, 36, 38; No. 9, 46, 60 (July 31-Aug. 14, Aug. 28, 1919); C. A. xiii, 2441.

Boon. See *Mucuna urens*.

Borassus flabellifer. Palmyra palm. Barb tree.

Bulletin Imperial Institute, 1912.

Cooke, C. S., 1887, page 92.

Linnard, page 5.

MELL, C. D. Palmyra palm leaves as a paper substitute. Paper Trade J. lvi, No. 8, 237-239 (Feb. 20, 1913); Paper Maker's Mo. J. No. 4, 148 (Apr. 15, 1913); Paper Maker xlv, 365 (Apr. 1, 1913).

NEW raw materials for papermaking. Papier-Ztg. xxxvii, 3537-3538 (1912); C. A. vii, 1286.

Bottle tree. See *Sterculia*.

Bottom bog rush. See *Scirpus sphaerocephalus*.

Bourdee.

PAPERMAKING possibilities in Egypt. Paper xxv, No. 13, 371 (1919).

Bowstring hemp. See *Sansevieria zeylanica*.

Bracken.

Archer.

SUBSIDIARY materials for board making. Paper Making xxix, No. 3, 91 (Mar., 1910).

Bracystegia randii.

AFRICAN papermaking materials. Bull. Imp. Inst. xv, 1-7 (1917); Paper Maker liv, No. 4, 329 (Oct. 1, 1917); Annual No., 1917-1918, page 74; Paper Makers' Mo. J. lv, 279-280 (Sept. 15, 1917); Commerce Reports, No. 304, 1205 (Dec. 29, 1917); C. A. xi, 2962; J. Soc. Chem. Ind. xxxvi, 1004; Paper xxi, No. 21, 21 (Jan. 30, 1918); Pulp Paper Mag. Can. xvi, 142; Paper Trade J. lxvi, No. 10, 46, 48 (Mar. 7, 1918).

Brake. See *Pteris*.

Bramble. See *Rubus*

Bran.

Munsell, page 57.

STEIGER, E., SCHULZE, E., and AUER-SCHOLLENBERGER, C. Improved process of treating bran and other cereal substances for obtaining sugar, ————, and paper. English Patent 12,920. Aug. 15, 1889. J. Soc. Chem. Ind. ix, 878.

BRAND, CHARLES J. The utilization of crop plants in papermaking. (In: U. S. Dept. of agriculture. Yearbook, 1910, pages 329-340. Illus. 23 cm. Washington, 1911.)

BRAND, CHARLES J. Crop plants for papermaking. U. S. Dept. of agriculture, Bureau of plant industry. Circular No. 82. Washington, Govt. print. off., 1911, 20 pp. illus. 23 cm. (Reprinted, 1916).

Bran—Continued.

This circular is printed on paper made wholly or in part from crop wastes and by-products from corn, broom corn, rice and cotton.

It is reprinted, in full or in part in: Paper v, No. 9, 13-14; No. 10, 13-14; No. 11, 13-14; No. 12, 12 (Nov. 15-Dec. 6, 1911); World's Paper Trade Rev. lvi, No. 17, 782-785; No. 18, 824-826; No. 19, 878-880 (Oct. 27-Nov. 10, 1911); lvii, No. 6, 293-296 (Feb. 9, 1912); J. Soc. Chem. Ind. xxxi, 120.

Brank. See *Fagopyrum esculentum.*

Brassica. Cabbage. Turnip.

FORNOFF, W. Cellulose and cattle fodder. German Patent 279,516. Jan. 17, 1914. C. A. ix, 1247; J. Soc. Chem. Ind. xxxiv, 348.

JOHNSON, G., and MALORY, J. Utilization of an improved natural fiber or substance in the manufacture of paper, etc. English Patent 1,530. 1883. J. Soc. Chem. Ind. ii, 545.

Lindsay, 1858.

Schaeffer, 1772.

Brassica campertria. Rape.

HEUSER, E., and BLASWEILER, T. Rape straw as a paper and fodder material. Papier-Ztg. xliii, 593, 613 (1918); Chem.-Ztg. xlii, Rpt., 108 (1918); J. Soc. Chem. Ind. xxxvii, 547 A; Paper Maker lvii, 152 (1919); J. Ind. Eng. Chem. xi, 479 (1919); C. A. xiii, 261, 1390; Paper xxiii, No. 11, 287 (Nov. 20, 1918).

Mierzinski.

Brazil wood. See *Caesalpina braziliensis.*

Brazilian grass. See *Arundo sellowiana.*

Brazilian mallow. See *Abutilon bedfordianum.*

Bread fruit tree. See *Artocarpus incisa.*

Broad leaved flax lily. See *Diannella tasmanica.*

Bromelia ananas. See *Ananas sativa.*

NEW raw materials for papermaking. Papier-Ztg. xxxvii, 3537-3538 (1912); C. A. vii, 1286.

Bromelia pinguin. Pinguin. Wild pineapple.

Dodge, C. R., 1897, page 95.

Kirchner, vol. II, 75.

Mierzinski.

Strothers, 1883.

Bromelia langenaria.

BRAZILIAN fiber for papermaking. Paper Makers' Mo. J. xlviii, No. 6, 200 (June 15, 1910); World's Paper Trade Rev. lvi, 178 (1910).

Bromelia sylvestris. Wild pineapple of the West Indies.
Bulletin Imperial Institute, 1912.
Dodge, C. R., 1897, page 96.
Mierzinski.
Strothers, 1883.

BROMLEY, HENRY A.
The technology of the common papermaking fibers. Paper Maker xlviii, No. 6, 795 (Dec. 1, 1914).

Broom. See *Aristida setacea.*
Cytisus scoparius.

Broom corn. See *Andropogon sorghum vulgaris.*

Broom-leaved tea tree. See *Melaleuca gentiatifolis.*

Broom root grass. See *Epicampes macroura.*

Bror. See *Corypha etata.*

Broussonetia papyrifera. Paper mulberry. Kodzu. Kozo. Tapa-cloth.
Archer, 1876.
Bull. Misc. Inform., Kew, 1879, page 33.
CREVORT, C. Manufacture of paper in Annan. Bull. econ. gouv. gén. Indo Chine x, 789-797; C. A. ii, 1344.
Cross, Bevan, and King, page 51.
Dodge, C. R., 1897, page 98.
DODGE, C. R. Japanese paper fibers. Paper Trade J., June 30, 1904.
GLENDINNING, H. Manufacture of paper in Corea. Foreign Office Diplomatic and Consular Reports, 1900, Annual Series, 2511, 7-9; J. Soc. Chem. Ind. xix, 925.
Griffin and Little, page 128.
Hannan, page 135.
Imperial Institute, 1909.
JAPANESE papermaking. Foreign Office Diplomatic and Consular Reports, 1905, No. 635; J. Soc. Chem. Ind. xxiv, 937.
JAPANESE paper plants. Paper Mill xxxvi, 116-120 (1913); Paper Maker, Mar. 1913, page 419.
Kirchner, II, page 76.
Lauboeck, 1893.
Main, F.
Martens, 1889.
MELL, C. D. Paper mulberry as a source of cloth and paper. Paper Trade J., lvi, No. 12, 54, 56 (Mar. 20, 1913).
PAPERMAKING in Corea. Paper Trade J. xxxi, No. 11, 332 (Sept. 13, 1900).
Raines, 1913.
Royle, 1855, page 341.
Scott, 1915.
Setlik, 1907.

Broussonetia papyrifera—Continued.

SINDALL, R. W. Manufacture of paper in the Shan States, Burma. Paper Makers' Mo. J. xliv, No. 3, 92-94 (Mar. 13, 1906).

Spon, vol. I, 933.

U. S., Bureau of Foreign Commerce.

Valenta, 1904.

Watt, vol. I, page 538; vol. VI, part 1, page 107.

BROWN, WM. H., and FISCHER, A. F. Philippine bamboos. Manila, Bureau of printing, 1918.

32 p. and 32 plates. 23.5 cm. (Philippine Islands. Dept. of agriculture and natural resources. Bureau of forestry. Bull. No. 15.)

BROWN, WM. H., and FISCHER, A. F. Philippine forest products as sources of paper pulp, Manila. Bureau of printing, 1918.

13 p. 23.5 cm. (Philippine Islands. Dept. of agriculture and natural resources. Bureau of forestry. Bull. No. 16.)

Brown bent. See *Agrostis canina.*

Brown grass. See *Agrostis canina.*

Brown hemp. See *Crotalaria juncea.*

Buckwheat. See *Fagopyrum esculentum.*

Bull grass. See *Spartina cynosuroides.*

Bullen of plants.

Munsell.

Bullock's heart. See *Anona reticulata.*

Bulrush. See *Scirpus lacustris.*
Typha angustifolia.

Bun ochra. See *Urena lobata.*

Buri palm. See *Corypha etata.*

Bur-reed. See *Sparganium.*

Butea frondosa. Butea gum. Dak. Bengal kino. Bastard teak.

Dodge, C. R., 1897, page 101.

Emerson, 1907.

Liotard.

Watt, vol. I, page 552.

Butea gum. See *Butea frondosa.*

Button bog rush. See *Schoenus sphaerocephalus.*

Button flower, African. See *Dais continifolia.*

Byrony roots.

Archer, 1876.

Lindsay, 1858.

Piette.

C

Cabbage. See *Brassica.*

Cactaceae. Cactus.

CACTUS and yucca. Paper Mill xxiv, No. 15, 26 (Apr. 13, 1901).

CACTUS pulp. Paper Makers' Mo. J. xlvi, No. 2, 62 (Feb. 15, 1908).

von Streeruwitz.

Cactus. See *Cactaceae.*

Caesar weed. See *Urcana lobata.*

Calamagrostis nigricans.

Mueller, L., 1877.

Calamus verus. Rattan.

Watt, vol. I.

Calcutta mat rush. See *Cyperus tegetum.*

Caldera bush. See *Pandanas odoratissimus.*

Calluna vulgaria. Heather. Heath. (*Erica vulgaris*).

Archer.

McElhenie, 1910.

ROGER, —. Converting heather, etc., into paper stock. French Patent 396,760. Nov. 17, 1908. C. A. iv, 109; Moniteur xlv, 227,229 (1909).

SINDALL, R. W., and BACON, W. Heather and bracken. Paper Makers' Mo. J. lv, 179 (June 15, 1917).

Calotropis gigantea. Giant asclepias. Mudar. Yercum. Madar.

Bull. Misc. Inform., Kew, 1881.

Dodge, C. R., 1897, page 104.

Liotard, page 5.

Phillips, 1915, page 629.

Spon, vol. I, page 933.

Watt, vol. II, page 34.

Calotropis hamiltonii.

Liotard, page 36.

Calotropis procera. Madar. Ak.

Emerson, 1909.

The fiber of *Calotropis procera.* Bull. Imp. Inst. xi, 204-206 (1913).

Camelina sativa.

Dodge, C. R., 1897, page 105.

Camelote. See *Panicum myurus.*

CAMPBELL, J. Papermaking possibilities in Queensland. World's Paper Trade Rev. lxvii, No. 6, 2-3 (Feb. 9, 1917).

Canada golden rod. See *Solidago canadensis.*

Canada rice. See *Zizania aquatica.*

Canary grass. See *Phalaris canariensis.*

Cane fiber. See *Arundinaria gigantea.*
Arundinaria tecta.

Canhamo braziliensis. Perini.

EXPERIMENTS with a West Indian fiber. World's Paper Trade Rev. lxiv, No. 26, 1156 (Dec. 31, 1915).

NEW Brazilian fiber. World's Paper Trade Rev. xlviii, 665-667 (Oct., 1907); C. A. ii, 584.

PERINI. Manufacture of paper. French Patent 370,547. Sept. 17, 1906. C. A. ii, 1364.

POSSIBILITY of papermaking from a Brazilian fiber. Paper Trade J. lxv, No. 23, 24 (1917); Pulp Paper Mag. Can. xvi, 30.

Cannabis indica.

Montessus de Ballore, page 199.

Cannabis sativa. Common hemp. Ganja. Bhanga Indian hemp. Kangra hemp.

ANDERSON, GEORGE E. Hemp fiber for papermaking. Daily Commerce and Trade Reports, May 16, 1912, No. 116, 632-633; Paper vii, No. 13, 38 (June 12, 1912).

Brand, 1916.

CUSHING, M. A. Treating hemp, flax, etc., for the manufacture of paper. U. S. Patent 50,419. Oct. 10, 1865.

DEWEY, LYSTER H., and MERRILL, JASON L. Hemp hurds as papermaking material. Oct. 14, 1916. U. S. Dept. of agriculture, Bull. No. 404. 26 pp. illus. 23 cm.

This bulletin is printed on paper manufactured from hemp hurds.

Abstracts of this bulletin are found in: World's Paper Trade Rev. lxvi, No. 23, 980-981 (Dec. 8, 1916); Pulp Paper Mag. Can. xv, No. 2, 53, 62 (Jan. 11, 1917); Paper xix, No. 7, 18-19 (Oct. 25, 1917); Sci. Am. cxvi, 127 (Feb. 3, 1917).

Dodge, C. R., 1897, page 106.

Griffin and Little, page 126.

HEMP stalks fragments for papermaking. Indian Record xxi, No. 21, 7 (1916); Paper Making xxxv, No. 11, 341.

HEMP waste for paper. Pulp Paper Mag. Can. iv, No. 3, 79-80 (Mar., 1906).

Liotard, page 7.

Montessus de Ballore, page 199.

PAPER from hemp hurds. Paper Maker lii, No. 4, 415 (Nov. 1, 1916).

RAGNO, SAVERIO. Paper from refuse hemp stalks. World's Paper Trade Rev.; Pulp Paper Mag. Can. ii, No. 10, 291-292 (Oct., 1904).

Schaeffer, 1772.

SMITH, B. C. Making cane hemp for making paper. U. S. Patent 3,349. Nov. 21, 1843.

Spon, vol. I, page 934.

Valenta, 1904.

Cannabis sativa—Continued.

VALUE of refuse hemp stalks as a papermaking fiber. World's Paper Trade Rev., Sept. 16, 1904, pages 8-9.
Watt, vol. II, page 107.

Cannabis sinesis.
Montessus de Ballore, page 199.

Cardamon (Stem and leaves).
Davis.

Carduus nutans. Musk thistle.
McElhenie, 1910.
Mierzinski.
Schaeffer, 1772.

Carex. Sedge.
Lindsay, 1858.

Carex appressa. Sedge grass.
Davis.
Phillips, 1915, page 257.

Carex brizoides.
Dodge, C. R., 1897, page 110.

Carex paniculata.
Guilfoyle.
Hargreaves, Bull. No. 1.

Carex pseudo-cyperus. Galingale rush. False hedge.
Guilfoyle.
Phillips, 1915, page 257.

Carex tereticaulis.
Guilfoyle.

Careya arborea. (Bard.)
Dodge, C. R., 1897, page 111.

Carludovica palmata. Panama hat straw.
Davis.
Dodge, C. R., 1897, page 111.

Caryota ureus. Kittool or Jaggerty palm.
Dodge, C. R., 1897, page 112.
Guilfoyle.
Mueller, L., 1867.

Casuarina leptoclada. Erect she oak.
Mueller, L., 1867, page 31.

Casuarina stricta. Drooping she oak.
Dodge, C. R., 1897, page 114.

FAVIER, E., VIDAL, L., and MATHEY, A. **Preparation** and properties of cellulose from eucalyptus and casuarina plants. Moniteur xlix, No. 12, 272-277 (1913).
Hargreaves, Bull. No. 1.
Mueller, L., 1867, page 31.

Cat tail. See *Typha latifolia.*

Catkins (Black poplar).
Arnot.

Cauliflower. See *Brassica.*

Cavanillesia platanifolia. Volandero.
Dodge, C. R., 1897, page 114.
Phillips, S. C., 1915, page 629.
Spon, vol. I, page 938.

Cay gio. See *Daphne involucrata.*

Cecropia. Trumpet tree.
Dodge, C. R., 1897, page 114.
Lindsay, 1858.

Celmisia coriacea. Leather plant. Tekapu.
Dodge, C. R., 1897, page 115.
Lindsay, 1858.
Wiesner.

Cenodruli.
Davis.

Century plant. See *Agave americana.*

Cephalostachyum pergacile. Bamboo.
Raitt, 1912.

Ceylon neyanda. See *Sansevieria zeylanica.*

Chaff.
Davis.

Chemaerops excelsa.
Spon, vol. I, page 938.

Chamaerops humilis. Dwarf palm.
Archer.
Dodge, C. R., 1897, page 116.

DWARF palm as a papermaking material. Bull. syndicat fabricants papier carton, France No. 9, 136-137 (May 15, 1920).

JORDAN, JOSEPH. Manufacture of paper pulp and paper. U. S. Patent 264,268. 1882. J. Soc. Chem. Ind. ii, 45.

PALMETTO leaves for papermaking. Paper Maker lix, No. 4, 474 (Apr. 1, 1920); Paper xxvi, No. 2, 22 (Mar. 17, 1920).
Royle, 1855, page 96.

RUBY, A. New raw material for papermaking. The dwarf palm. Papier xxii, 193-196 (July, 1919); C. A. xiii, 24-41; Paper xxv, 612.
Strothers, 1883.

Chamaerops palmata.
Mierzinski, page 13.

Changeable hibiscus. See *Hibiscus mutabilis.*

CHARFENTIER, PAUL FERDINAND. Le Papier. Paris, Vve Ch. Dunod, 1890.

434 p. illus.

Being X, Applications de chimie organique—partir 5 of Encyclopedie chimique, publiée sous la direction de M. Fremy, etc.

Paper,.....being vol. 10, part 5, of Fremy's chemical encyclopedia.

China grass. See *Boehmeria nivea.*

China jute. See *Abutilon avicennae.*

Chinese rose. See *Hibiscus rosa-sinensis.*

Chinese sugar cane. "Sorgo-sucre."

Munsell.

Chorisia speciosa.

Dodge, C. R., 1897, page 118.

Mueller, L., 1877.

Cissus.

Davis.

Citronella grass. See *Andropogon nardus.*

Citrus fruit pulp.

GIBBS, H. D., and AGCAOILI, F. Philippine citrus fruits; their commercial possibilities and a chemical study of a few of the more important varieties. Philipp. J. Sci. 7A, 403-415 (Dec., 1912); C. A. vii, 2806.

Cladium effusum. Saw grass.

Ellis, H. E., 1917.

Manufacture of paper from Florida saw grass. Paper xxvii, No. 2, 20 (Sept. 15, 1920).

STRONG, FREDERICK. New source of paper supply. Paper xi, No. 11, 19 (1913); Paper Maker xlvi, No. 5, 745, 747 (Nov., 1913); Paper Trade J. lvi, No. 8, 313-315 (Feb. 20, 1913); Paper Makers' Mo. J. li, 397-399 (Sept. 15, 1917).

Cladium glomeratum.

Lightfoot, Bull. No. 11, page 34.

Cladium mariscus. American saw grass.

REMINGTON, J. S., BOWACK, D. A., and DAVIDSON, C. W. Paper pulp from American saw grass. World's Paper Trade Rev. liv, 299 (1911); Aynsome Annual iii, 5-11 (1911); J. Soc. Chem. Ind. xxxi, 582; C. A. v, 197.

Cladium preissii. Swamp grass.

Lightfoot, Bull. No. 11, page 34.

Cladium radula. Black reed. Cutting grass.

Davis.

Phillips, 1915, page 257.

Cladophora conifera.

SCOTT, James. *Cladophora conifera* as pulp. Its minute features. Paper Maker, Intern. No., 1916-1917, pages 26-27.

CLARK, FRED C.

Classification of vegetable fibres used in papermaking. Paper xxv, 697 (Dec. 10, 1919).

CLARK, FRED C.

Vegetable fibers used in papermaking. Paper xxiii, 944-946 (Feb. 26, 1919).

Clematis vitalba.

Lindsay, 1858.

Clematite.

Munsell.

Clover. See *Trifolius.*

Club rush. See *Scirpus fluviatilis.*

Coast sword grass. See *Lepidosperma elatius.*

Coast sword rush. See *Lepiodosperma gladiata.*

Cochlearia amoracia. Horse radish.

Hannan, page 126.

Cockle burr. See *Althea frutex.*

Cocoanut. See *Cocos nucifera.*

Cocos nucifera. Cocoanut. Coir.

Bull. Misc. Inform., Kew, Sept., 1887, page 19; Selected Papers, I, page 274.

COCOANUT fiber as raw material in papermaking. Papierfabr. ix, No. 11, 325 (Mar. 17, 1911); Zentr. oesterr-ungar. Papierind. xxviii, 866-867 (1910).

COCOANUT fiber in papermaking. Paper Making xxix, No. 11, 425 (Nov., 1910).

Cross, Bevan, and King, page 52.

Dodge, C. R., 1897, page 120.

Ellis, H. E., 1917.

Griffin and Little, page 128.

Hooper, 1909-1910.

Kirchner, II, 75.

KUESS, V. J. Paper pulp from the fruit of the cocoanut palm. English Patent 29,480. Dec. 16, 1909. French Patent 409,614. Nov. 25, 1909. J. Soc. Chem. Ind. xxix, 751; C. A. v, 1335; Paper Makers' Mo. J. xlviii, No. 8, 289 (Aug. 15, 1910).

Liotard.

PAPER from cocoa fiber. Paper Making xxvii, No. 1, 30-31 (Jan. 1908); Paper Makers' Mo. J. xlvi, No. 1, 15 (Jan. 15, 1908); C. A. ii, 1489.

Spon, vol. I, page 939.

Watt, vol. II, page 426.

Cogon grass. See *Imperata exaltata.*

Coir. See *Cocos nucifera.*

Colocasis antiquorum. Sago palm.
Dodge, C. R., 1897, page 124.
Watt, vol. II, page 509.

Colorado hemp. See *Apocynum cannabinum.*

Coltsfoot. See *Tussilage.*

Commersonia fraseri. Tie plant of Australia.
Dodge, C. R., 1897, page 124.

Common rush. See *Juncus pauciflorus.*

Compositae.
Lindsay.

Conferva. Swamp moss. Water moss.
Davis.
Mueller, 1867, page 33.
SOME early facts about vegetable fibers. **Paper Maker li,** No. 6, 571 (June 1, 1916).
Villette.

Conkanee hemp.
Mierzinski, page 25.

Convallaria. Lily of the valley.
Schaeffer, 1772.

Convovulaceae.
Le Normand.

Coral moss.
Davis.

Corchorus capsularis. Jute. Jew's mallow. Pat.
Cross and Bevan, page 106.
Dodge, C. R., 1897, page 125.
Dodge, 1910.
Griffin and Little, page 125.
HERGIS, O. Use of jute in the manufacture of fine paper. Chem.-Ztg. xxxv, 1346; C. A. vi, 3017.
Hoffmann, 1873, 317-321.
Hübner, 1903, page 17.
JUTE for papermaking. Paper Making xxxii, No. 1, 17-19.
KERR, H. Jute in Bengal and on Indian fibers available for the manufacture of paper. Calcutta. 1874. 17 pp.
Kirchner, vol. II, page 73.
Lindsay, 1858.
Liotard.
Montessus de Ballore, page 224.
Royle, 1855, page 383.
Spon, vol. I, page 940.
Valenta, 1904.
Watt, vol. II, page 535; vol. VI, part 1, page 107.

Corchorus olitorius. See *Corchorus capsularis.*

Cord grass. See *Spartina cynosurides.*

Cordia myxa. Mulberry. Sebesten.
Davis.
Dodge, C. R., 1897, page 133.
Watt, vol. II, page 563.

Cordyline australis. Forster's palm lily. New Zealand cabbage tree. Ti kouha.
Dodge, C. R., 1897, page 134.
Phillips, S. C., 1915, page 259.
Spon, vol. I, page 945.

Cordyline banskii. Bank's palm lily.
Dodge, C. R., 1897, page 134.
Guilfoyle.

Cordyline indivisa. Tall palm lily. Mountain flax. Toi.
Dodge, C. R., 1897, page 134.
Spon, vol. I, page 945.

Coreya arborea.
Liotard.

Cork. See *Quercus suber.*

Corn. See *Zea mays.*

Coroa.
WASTE coroa fiber for paper. World's Paper Trade Rev. lv, No. 15, 732 (Apr. 14, 1916).

Corragine. See *Plagianthus sidoites.*

Corypha elata. Buri palm. Bror.
Brown and Fischer, Bull. 16, page 9.
Richmond, 1907.

Corypha umbraculifera. Talipot palm. Fan palm.
Dodge, C. R., 1897, page 135.
Mueller, L., 1877.
Piette.
Watt, vol. II, page 575.

Coton du peuplier.
Schaeffers.

Cotton. See *Gossypium.*

Cotton grass. See *Eriophorum latifolium.*

Cotton stalk. See *Gossypium.*

Cotton tree. See *Bombax.*

Cotton wood, Indian. See *Bombax malabaricum.*

Couch grass. See *Triticum repens.*

Country mallow. See *Abutilon indicum.*

Cow itch tree. See *Lagunaria patersonii.*

Crab grass. See *Elcusine coracana.*

Crataegus. Hawthorne (Bark).
Davis.
Lindsay, 1858.

CREVORT, C. Manufacture of paper in Annam. Bull. econ. gouv. gén. Indo Chine x, 789-797; C. A. ii, 1344.

CROSS, CHARLES F., and BEVAN, E. J.
A text book of papermaking. 5th ed., containing additional matter and in part re-written, with collaboration of J. F. Briggs. London, E. and F. N. Spon, Limited; New York, Spon and Chamberlain, 1920.

CROSS, CHARLES F., BEVAN, E. J., and KING, C. M.
Report on Indian fibers and fibrous substances exhibited at the Colonial and Indian Exhibition, 1886; in association with E. Joynson, with notes of methods of treatment and uses prevalent in India, by Dr. George Watt. Published by authority of the Secretary of State for India. London, New York, E. and F. N. Spon, 1887. vi p., 11, 71 p., 5 plates. 22½ cm.

Crotalaria juncea. Sunn hemp of India. Sunn. Indian hemp. Brown hemp. Madras hemp. False hemp.
Archer, 1876.
Bull. Misc. Inform., Kew, Sept., 1887, pages 4-19; Selected Papers, I, 274.
Cross and Bevan, page 104.
Dodge, C. R., 1897, page 139.
Emerson, 1909.
Griffin and Little, page 127.
Kirchner, vol. II, page 75.
Liotard, page 6.
Montessus de Ballore, page 272.
Spon, vol. I, page 946.
Watt, vol. II, page 595; vol. VI, part i, page 107.

Crotalaria tenuifolia. Jubbulpore hemp.
Dodge, C. R., 1897, page 141.
Liotard.
Watt, vol. II, page 595.

Crowia. See *Ananas sativa.*

Cruciferae. Mustard family.
Archer.
Lindsay, 1858.

Cryptograms.
Davis.

Cryptostegia grandiflora.
Beadle and Stevens, 1913.

Cuahulose. Cuazuma.

NEW vegetable fiber. Papier xxii, 175 (1919); Chem. Met. Eng. xxii, No. 11, 492 (Mar. 17, 1920); C. A. xiii, 2440; Paper xxv, 612.

Cuazuma. See *Cuahulose.*

Cucumber. See *Cucumis.*

Cucumis. Cucumber.

Davis.

Cucurbitaceae. Gourds (Vines).

Lindsay, 1858.

Cud Weed. See *Gnaphalium.*

Cupang. See *Parkia roxburghii.*

Cupheae.

Davis.

Currassavica.

Mueller.

Currijong. See *Pimela axifolia.*

See *Sterculia villosa.*

Custard Apple. See *Anona squamosa.*

Cutting grass. See *Cladium radula.*

Cymbopogon nardus. Tambookie grass. Tambuki.

HEITMANN, G. New paper materials for England. Papier-Ztg. xli, No. 81, 1566 (1916).

Juritz, page 1.

NEW paper materials for England. Papier-Ztg. xli, No. 79, 1522 (1916).

PAPERMAKING materials from South Africa. Bull. Imp. Inst. xiv, 163-167 (1916); Paper Maker lii, No. 4, 341 (Oct., 1916); Paper Maker's Mo. J. liv, 302 (1916); World's Paper Trade Rev. lxvi, No. 14, 624 (Oct. 6, 1916); C. A. xi, 99; J. Soc. Chem. Ind. xxxv, 1008.

Phillips, S. C., 1915, page 261.

SOUTH African grasses for papermaking. Bull. Imp. Inst. xvii, No. 2, 142 (1919); Agr. News xviii, 39 (1919).

Cymbopogon ruprechti. Tambookie grass.

INVESTIGATION of materials suggested for the manufacture of paper. Bull. Imp. Inst. xvii, No. 2, 142 (1919).

Cymbopogon validus. Tambookie.

PAPERMAKING in South Africa. Paper xix, No. 16, 22 (Dec. 27, 1916).

Cynara. Artichoke.

Piette.

Cyperus alopecuroides.

INVESTIGATION of materials suggested for the manufacture of paper. Bull. Imp. Inst. xvii, No. 2, 152-154 (1919).

Cyperus corymbosus. Reed-like grass.
Dodge, C. R., 1897, page 143.

Cyperus dives. Diss.
Piette.

Cyperus hexangulare.
Leighton, J., 1918.

Cyperus longus. Long cypress grass.
Piette.
SCOTT, J. A sedge microscopically examined. **Paper Maker lviii, No. 3, 325 (Sept. 1, 1919).**

Cyperus lucidus. Galingale rush. **Galangal. Shining rush.**
Dodge, C. R., 1897, page 144.
Guilfoyle.
Lindsay, 1858.
Mueller, 1867, page 31.
Phillips, S. C., 1915, page 257.

Cyperus papyrus. Papyrus. *Papyrus antiquorum.* **Egyptian** paper plant. Nile sudd.
Archer, 1876.

BEAM, WM. Papyrus and paper **manufacture. Wellcome** Trop. Research Lab., Khartoum, Chem. **Sect., Bull. 2, Mar.** 1915, 4 pages; Paper Maker 1, No. 3, **292 (Sept., 1915);** Annual No., 1914-1915, pages 79-80; **World's Paper Trade** Rev. lxiv, No. 20, 793-795 (Nov. 12, **1915); Paper Making** xxxiv, No. 11, 340-341 (1915); **Paper xvii, No. 6, 13-14** (Oct. 20, 1915); C. A. ix, 3129; J. Soc. **Chem. Ind. xxxiv, 792.**

CROSS, C. F., and BEVAN, E. J. **Papyrus grass. World's** Paper Trade Rev. lxx, 303 (1918); Paper **xxiii, 207; Papier-**Ztg. xliii, No. 80, 1862 (1918).
Dodge, C. R., 1897, page 144.

FOURNIER, RAYMOND. Papyrus. **Papier xxiii, No. 8,** 178-180, No. 9, 197-200 (Aug., Sept., 1920).

GASTON, M. D. Papyrus as a **papermaking material.** World's Paper Trade Rev. lii, No. 11, 441 **(Sept. 10, 1909);** Paper Trade J. xlix, No. 14, 46 (Sept. 30, **1909); Paper** Makers' Mo. J. xlvii, No. 11, 382 (Nov. 15, **1909); C. A. iv,** 1100.

HOERING, PAUL. Substitute for flax, **etc., from *cyperus papyrus*** L. German Patent 290,605; 291,302. **Papier-Ztg. xli,** No. 37, 701 (1916); Chem.-Ztg. xl, R 178 **(1916).**

INVESTIGATION of materials suggested **for the manu**facture of paper. Bull. Imp. Inst. xvii, No. 2, **154-155 (1919).**

JOSEPH, A. F., and MARTIN, F. J. **A preliminary ac**count of the chemistry of the Nile sudd. J. Soc. **Chem. Ind.** xxxix, 91-94 T (1920); C. A. xiv, 2082.

Cyperus papyrus—Continued

JURITZ, C. F. Grasses of the Eastern coast belt. S. African J. Ind. i, 431, 516 (1918); Bull. Imp. Inst. xvi, No. 4, 578 (1918).

KÄFKA, K. L. Paper from papyrus. Zentr. oesterr-ungar. Papierind. xxxv, No. 20, 376-377 (1917).

Koops, 1801.

Lindsay, 1858.

MADDOX, HARRY A. Papyrus as a papermaking material. Paper v, No. 2, 9-10 (Sept. 27, 1911).

MARSH plants of the Nile for papermaking. Papier-Ztg. xxxviii, 779 (1913).

Montessus de Ballore, page 251.

NEW pulp for paper. Paper Maker xlv, No. 3, 377 (1913); Paper Makers' Mo. J. li, 52-53 (Feb. 15, 1913).

NEW raw materials for papermaking. Papier-Ztg. xxxvii, 3537-3538 (1912).

NILE sudd for paper pulp. Daily Consular and Trade Reports, Mar. 8, 1913, No. 55, 1178-1179; Paper xi, No. 5, 20 (Apr. 16, 1913); Paper Making xxxii, No. 4, 129 (1913); C. A. vii, 1970.

Norton, 1910, I.

NORTON, J. S., and WIRTZ, J. Papyrus for papermaking. World's Paper Trade Rev. xlvii, 737-742 (May, 1907); C. A. ii, 180.

PAPER and peat from papyrus. Wochbl. Papierfabr. xlii, 3178; xliii, 1537-1539.

PAPER from papyrus pulp. Paper ii, No. 5, 32 (Jan. 25, 1911).

PAPERMAKING materials from South Africa. Bull. Imp. Inst. xiv, 163-167 (1916); Paper Makers' Mo. J. liv, 302 (1916); Paper Maker lii, No. 4, 342 (Oct., 1916); C. A. x, 3157; xi, 99.

PAPERMAKING prospects in Egypt. Paper xxv, 13, 371 (Sept. 10, Oct. 22, 1919).

PAPYRUS. Papier-Ztg. xvi, 2528 (1891); J. Soc. Chem. Ind. xi, 55.

PAPYRUS as a papermaking material. Paper Maker, Sept., 1907.

PAPYRUS as a raw material. Paper Maker xlviii, 554 (Oct., 1914).

PAPYRUS for papermaking. World's Paper Trade Rev. xlvii, No. 18 (May 3, 1907); Pulp Paper Mag. Can. v, No. 6, 136-137 (June, 1907).

PAPYRUS from Zululand. World's Paper Trade Rev. lxvi, No. 15, 663 (Oct. 13, 1916).

Cyperus papyrus—Continued

PAPYRUS "Kabelpapier." **Wochbl. Papierfabr. xli, 4413** (1910); Papier-Ztg., Dec. 15, 1912, page 3611.

PAPYRUS pulp. **Paper Mill xli, No. 23, 1 (1918); Pulp Paper Mag. Can. xvi, 695; Paper xxii, 411.**

PAPYRUS, the plant and its paper. **Paper Trade J. xliii, No. 3, 22, 26, 30 (July 19, 1906).**

Phillips, S. C., 1915, page 263.

PULP from the papyrus grass in Zululand. **Svensk Pappers-Tidning, July 31, 1918, page 323; Paper xxiii, 491; Pulp Paper Mag. Can. xvii, 37.**

REVIVAL of the papyrus for papermaking. **Paper v, No. 13, 11** (Dec. 13, 1911); Papier xiv, No. 10, 113-114; No. 19, 220-221 (1911); Paper Trade J. xliv, No. 5, 40 (Jan. 31, 1907).

SELLEGER, E. L. Modern papyrus preparation. **Paper Making xxvi, 65** (Feb., 1907); Paper Makers' Mo. J. xlv, No. 3, 99-100 (Mar. 15, 1907); C. A. ii, 316.

SMITH, WM. Utilizing *Cyperus papyrus*. **English Patent 19,150.** Aug. 20, 1909. C. A. v, 2330.

Spicer, H. H. See Wells, J.

SUDD and papyrus for papermaking. **Paper Maker xlvi, No. 3, 376-377** (Sept. 1, 1913); Paper Makers' Mo. J. li, 381 (Sept. 15, 1913).

VIDAL, L. Micrography of paper pulp from papyrus. Moniteur xlvi, 285-287 (June 15, 1910); Papierfabr. viii, 1042-1045 (1910); Paper Making xxix, No. 8, 297-299 (Aug., 1910); C. A. iv, 3003.

WELLS, J. Paper pulp. English Patent 120,086. Oct. 24, 1917. C. A. xiii, 379; Paper xxiv, 120, 268; J. Soc. Chem. Ind. xxxviii, No. 1, 8A (Jan. 15, 1919).

WIESE, —. Ancient papyrus manufacture. **Papierfabr. vii, No. 35, 875-877** (Sept. 3, 1909).

WREDE, J. Papyrus as a papermaking material. **Paper Maker xxxiv, 309-315** (Sept., 1907); C. A. ii, 178.

Cyperus tegetum. Calcutta mat rush.

Dodge, C. R., 1897, page 145.

Cyperus textilis. Mat rush. Matjesgoed (?).

Juritz, page 80.

Leighton, J., 1918.

Liotard.

PAPER shortage in Australia. Natural resources untouched. Paper Maker lvi, No. 3, 248 (Sept., 1918).

Phillips, S. C., 1915, page 259.

Spon, vol. I, page 947.

Cyperus vaginatus. Sheathed galingale.

Dodge, C. R., 1897, page 145.

Mueller, 1867, page 31.

Cyperus variegata. Mat grass.

Liotard, page 34.

Cytisus scoparium. *Gentisa scoparium.* Broom.

BROOM as a papermaking material. Paper Making xxxiii, No. 6, 227-228; Paper Maker xlviii, No. 1, 106 (July, 1914).

BROOM fiber for paper manufacture. Pulp Paper Mag. Can. ii, 338 (Nov., 1904).

DEVERRIERE, L. Paper pulp from broom. Moniteur, 1913, pages 185, 209, 233.

DIGTES, —. Use of broom in paper manufacture. Wochbl. Papierfabr. xlii, 2790-2791 (1911).

Dodge, C. R., 1897, page 146.

DODGE, C. R. New paper fibers. Paper Makers' Mo. J. xlix, 157-159 (1911); Papier-Ztg. xxxvi, 2666 (1911).

FINIELS, F. S. Manufacture of paper pulp from the broom plant. French Patent 440,329. May 1, 1911. J. Soc. Chem. Ind. xxxi, 812; Papeterie xxxiv, 642 (1912).

INDUSTRIAL use of broom in paper manufacture. Paper iv, No. 4, 11 (June 21, 1911).

LAKE, H. H. Paper pulp from the broom plant. English Patent 210. Jan. 3, 1896. J. Soc. Chem. Ind. xvi, 630.

NEPPI, CARLO. Industrial application of broom for paper pulp. Moniteur xlvii, No. 11, 257; No. 12, 281; No. 13, 308; No. 14, 332 (1911).

NEW pulps. Wochbl. Papierfabr. xliii, No. 38, 3497-3498 (1912); C. A. vi, 3517.

PERSICHETTI, S. Utilization of broom for the manufacture of paper pulp. French Patent 318,659. Feb. 13, 1902. J. Soc. Chem. Ind. xxi, 1467.

Spon, vol. I, page 947.

D

Daffodil.

BADOIL, A. Paper pulp from new fibers without the use of alkalies. French Patent 382,439. Oct. 1, 1907. J. Soc. Chem. Ind. xxvii, 244.

BADOIL, A., and VALADON, J. E. Manufacture of paper pulp from fibrous tubers and bulbs. French Patent 338,477. Nov. 28, 1903. J. Soc. Chem. Ind. xxiii, 677.

Dais continifolia. African button flower.

Dodge, C. R., 1897, page 146.

Daisies.

McElhenie, 1910.

Dak. See *Butea frondosa.*

Danchi. See *Sesbania aculeata.*

Daphne cannabina. *Daphne papyracea.* Nepal paper plant. Setburosa.

BHOLA, MATHURA P. Papermaking from *Daphne cannabina* in Garhwal. Independent xliv, No. 3, 125-126 (Mar., 1918.)

Dodge, C. R., 1897, page 146.

DOURON, E., and VIDAL, L. Papermaking tests with various colonial plants. Ann. musée colonial Marseille xxvi, 1-14 (1918); Bull. Agr. Intelligence x, 343; C. A. xiv, 2082.

Hannan, page 135.

Lindsay, 1858.

Liotard.

MELL, C. D. The gauze tree. Paper Makers' Mo. J. li, 358 (Aug. 15, 1913).

NATIVE Indian papermaking industry. Indian Forester xliv. 125 (1918); Paper Maker lvii, No. 3, 288 (Mar. 1, 1919); Paper xxiv, No. 6, 189 (Apr. 16, 1919); Bull. Imp. Inst. xvi. No. 3, 401 (1918).

Scott, Paper Maker, xlviii, 677.

Setlik, B., 1907.

Spon, vol. I, page 947.

Watt, vol. VI, part 1, page 108.

Daphne involucrata. Cay gio. Quarce.

Crevort.

PAPER tree of Tonkin. Bull. Imp. Inst., Sept., 1904; Paper Makers' Mo. J. xlii, No. 10, 341-342 (Oct. 15, 1904); Pulp Paper Mag. Can. ii, 322-324 (Nov., 1904).

Setlik, B., 1907.

Daphne longifolia. Nepal paper plant.

Watt, vol. VI, part 1, page 108.

Daphne mezerium.

JAPANESE paper plants. Paper Maker, Mar., 1913, page 419; Paper Mill xxxvi, 116-120 (1913).

Raines, 1913.

Daphne oleoides.

Davis.

Daphne papyracea. See *Daphne cannabina.*

Daphne wallichii.

Watt, vol. VI, part 1, page 108.

Darnel. See *Hordeum murinum.*

Date palm. See *Phoenix.*

Datura stramonium. Jimson weed. Thornapple. Stramonium.
Lindsay, 1858.

DAVIS, CHARLES THOMAS.
The manufacture of paper; being the description of the various processes for the fabrication, coloring, and finishing of every kind of paper. Philadelphia, H. C. Baird & Co.; London, S. Low, Marston, Searle and Rivington, 1886.
xxiv (17) 608 p. illus. 23½ cm.

Dead leaves. See *Leaves.*

Deccani. See *Hibiscus cannabinus.*

Deckanee hemp. See *Hibiscus cannabinus.*

Dek grass. See *Andropogon buchananii.*

Delta grass.
KLEIN, A. Delta grass cellulose. Paper Maker xlii, No. 3, 391-397 (1911).

Demia extensa.
Liotard.

Dendrocalamus strictus.
Cross, Bevan and King, page 49.
Dendrocalamus strictus, bamboo of the Dangs. Paper Maker, Annual No., 1915-1916, pages 85-91.
Dodge, C. R., 1897, page 148.

Dennisetum purpureum. Elephant grass.
PAPER pulp experiments in Uganda. Paper Maker li, No. 4, 320 (Apr. 1, 1916); 1, No. 1, 70 (July 1, 1915).

Desmodium argenteum.
Piette.

Desmodium latifolium.
Dodge, C. R., 1897, page 148.

Desmodium tilliaefolium.
Dodge, C. R., 1897, page 148.

Devil's cotton. See *Abroma augusta.*

Dhonchi. See *Sesbania aculeata.*

Dhunchee. See *Sesbania aculeata.*

Dianella latifolia. See *Dianella tasmanica.*

Dianella longifolia. Seacoast rush.
Davis.

Dianella tasmanica. Broad leaved flax rush. (*Dianella latifolia.*)
Dodge, C. R., 1897, page 149.
Guilfoyle.

Dichelachne crinata. Horsetail grass.
Dodge, C. R., 1897, page 150.
Mueller, 1867, page 32.

Diss. See *Ampelodesmos tenax.*
See *Arundo festucoides.*
See *Cyperus dives.*
See *Festuca patula.*

Dita. See *Alstonia scholaris.*

DODGE, CHARLES RICHARD (1897).
A descriptive catalogue of useful fiber plants of the world, including the structural and economic classifications of fibers. Washington, Govt. print. off., 1897.
361 p., front. illus., xii pl., 23 cm. (U. S. Dept. Agr., Fiber Investigation. Report No. 9.)

DODGE, CHARLES RICHARD.
Japanese paper fibers. Paper Trade J., June 30, 1904.

DODGE, CHARLES RICHARD.
New papermaking fibers. Paper Makers' Mo. J. xlix, No. 5, 157-159 (May 15, 1911); Paper Trade J. lii, No. 7, 147 (Feb. 16, 1911).

DODGE, CHARLES RICHARD.
Pulp wood substitutes. Paper Trade J. 1, No. 19, 35 (May 12, 1910); C. A. iv, 1804.

Dog grass. See *Triticum repens.*

Dog wheat. See *Triticum repens.*

Dogbane. See *Apocynaceae.*

Dombeya nataliensis. Lye plant.
Dodge, C. R., 1897, page 152.
Guilfoyle.

Doryanthes excelsa. Spear lily.
Dodge, C. R., 1897, page 152.
Guilfoyle.

Doum palm. See *Hyphaene thebaica.*

Dracaena draco. Dragon's blood tree.
Dodge, C. R., 1897, page 152.

Dragon's blood tree. See *Dracaena draco.*

Drooping she oak. See *Casuarina stricta.*

Dschut. See *Corchorus capsularis.*

Duckanee hemp. See *Hibiscus cannabinus.*

DUNSTON, W. R.
Fibers.
Colonial Reports (Great Britain), No. 58. 142 pages; Expt. Sta. Rec. xxi, 426.

Dwarf bamboo. See *Bambusa lumanpac.*

Dwarf palm. See *Chamaerops humilis.*

Dye wood, spent.
Lindsay, 1858.

Dyer's woad. See *Isatis tinctoria.*

E

EARL, J. C.

Grass trees: An investigation of their economic products. South Australia, Dept. of Chemistry, Bull. No. 6. 1917.

EARL, J. C.

Preliminary report on the papermaking value of various South Australian raw materials.

South Australia, Dept. of Chemistry, Bull. No. 1, 53-56 (1916).

EARLY experiments with new papermaking fibers in England. World's Paper Trade Rev. li, 617; C. A. iii, 1458.

Earth moss. See *Phoscum.*

Ecdericolea monostachya. Rush.

BELANI, E. Paper pulp from rushes. Papierfabr. vi, 604-605 (1908); J. Soc. Chem. Ind. xxvii, 707.

SOME new papermaking materials. Bull. Imp. Inst. xv, No. 1, 1-7 (1917); Paper xxiii, 285; J. Soc. Chem. Ind. xxxvi, 1004; Paper Trade J. lxvi, No. 10, 46, 48 (Mar. 7, 1918); C. A. xi, 2962.

THREE new papermaking materials. Commerce Reports, Dec. 29, 1917, No. 304, page 1203; Paper xxi, No. 21, 21.

ECOLE FRANCAISE de PAPETERIE, Grenoble.

Tests made in the laboratory. 1. At the request of the French Government.

2. Giant maize of Servia.
4. Passerina.
6. Algerian mallow.

ECOLE FRANCAISE de PAPETERIE, Grenoble.

Tests made in the laboratory. II. At the request of various manufacturers.

7. Vine branches.
12. Fibrous pericarp of the cocoanut.
13. Papyrus.
14. Reeds.
15. Typhaceae.
16. Moucou-moucou, or cayenne reed.
17. *Imperata cylindrica* (Indo-China reed).
18. Banana.
19. Giant fennel (ferula) of Corsica.
20. Dead leaves.
21. Pine needles.
22. Waste fiber.
23. Asphodel (branches and roots).
24. Diss (*Ampelodesmos tenax*).
25. Palmetto.
26. Aegagropsiles (Sea plant.)
27. Alfa.

Edgeworthia gardneri. Napal paper.

Dodge, C. R., 1897, page 154.

Spon, vol. I, page 948.

Watt, vol. VI, part 1, page 108.

Edgeworthia papyrifera. Japanese paper plant. **Mitsumata.**

Dodge, C. R., 1897, page 154.

Dodge, C. R., 1904.

Edgeworthia papyrifera. Papierfabr. vii, No. 17, 421; No. 19, 476 (Apr. 23, May 7, 1909).

FAIRCHILD, DAVID G. **Three new plant introductions** from Japan. Bureau of Plant Industry, **Dept. of Agr., Bull.** No. 42. June 24, 1903.

Contents (in part): **Mitsumata, a Japanese paper plant.** Pages 9-17. Abstracted in Paper Trade J. liii, No. 23, 561 (Dec. 6, 1906).

Höhnel, page 120.

JAPANESE paper plants. Paper Mill xxxvi, 116-120 (1913); Paper Maker, Mar., 1913, page 419.

JAPANESE papermaking. Foreign Office Diplomatic and Consular Reports, 1905, No. 635; J. Soc. Chem. Ind. xxiv, 937.

Kirchner, vol. II, page 76.

LAUBOECK, G. Japanese papers. Mitt. kgl. mech.-tech. Gew.-Mus. Wien, 1893, 11; J. Soc. Chem. Ind. xii, 286.

Martens, M., 1889.

Montessus de Ballore, page 275.

PAPERMAKING in Japan. Paper xxiii, No. 21, 566-568 (Jan. 29, 1919).

RAINES, RALEIGH. **Mitsumata paper. Pulp Paper Mag.** Can. xi, No. 14, 486-487 (July 15, 1913); Paper xii, No. 7, 19-20 (July 30, 1913); Paper Making xxxii, No. 8, 377-378 (1913).

Raines, 1913.

Scott, Paper Maker xlviii, 677.

Setlik, 1907.

Valenta, 1904.

Egyptian mummies.

DECK, ISAIAH. Egyptian mummies as a source of paper stock. Paper x, No. 13, 17-20 (Mar. 12, 1913).

Egyptian paper plant. See *Cyperus papyrus.*

Ehrharta tenacissima. Wire grass.

Davis.

ELLIS, H. E. Cellulose from reeds, wire **grass, and similar** materials. U. S. Patent 1,236,072. Aug. 7, 1917. C. A. xi, 2733.

Ejoo. See *Arenga saccharifera.*

Elder. See *Sambucus canadensis.*

Eleocharis scuta. Slender spike rush.
Dodge, C. R., 1897, page 156.
Mueller.
Phillips, 1915, page 259.

Elephant grasses.
PEARSON, R. S. Sources of paper in India. Paper xx, No. 24, 14 (Aug. 22, 1917).
See also *Dennisetum purpureum.*
Ochlandra travancorica.
Typha latifolia.

Eleusine coracana. Ragi millet. African millet. Crab grass.
Dodge, C. R., 1897, page 156.

Elodium caeruleum. Blue flag.
Davis.

Elymus arenarius. Sea lyme grass.
Dodge, C. R., 1897, page 156.

EMERSON, H. W.
Paper raw materials in Pendschab.
Paper Maker xxxviii, No. 1, 37 (July 1, 1909).

Epicampes macroura. Zacaton. Broom root. Mexican whisk.
Brand, C. J., 1911.
BRAND, CHARLES J., and MERRILL, JASON L. Zacaton as a papermaking material. U. S. Dept. of Agr., Bull. No. 309. Nov. 4, 1915. 28 pp. 23 cm.
Reprinted, in part or completely, in: Paper Maker 1, No. 6, 617 (Dec. 1, 1915); Paper Makers' Mo. J. liii, 389 (Dec. 15, 1915); Pulp Paper Mag. Can. xiv, No. 1, 11-12 (Jan. 1, 1916); Paper xvii, No. 8, 34 (Nov. 3, 1915); World's Paper Trade Rev. lxiv, No. 22, 874 (Nov. 26, 1916); Sci. Am. cxiv, 76 (Jan. 15, 1916).
POSSIBLE papermaking materials. Paper Maker lii, No. 1 (July 1, 1916).

Epilobium angustifolium. Willow herb. Fireweed.
Davis.
Dodge, C. R., 1897, page 159.
Hannan, page 126.

Eragrostis cynosuroides. Savannah grass.
See *Savannah grass.*

Erecthites heracifolia. Fireweed.
Hannan, page 133.
Spon, vol. I, page 948.

Erect she oak. See *Casuarina leptoclada.*

Erianthus ravennae. Savannah grass.
See *Savannah grass.*

Erica vulgaria. See *Calluna vulgaris.*

Erigeron. Fleabane.
Munsell.

Eriodendron anfractuosum. White cotton tree. Kapok. Pochote.
Bull. Misc. Inform., Kew, 1896, pages 204-207; Selected papers, vol. I, page 28.
Cross, Bevan, and King, page 52.
Dodge, C. R., 1897, page 160.
NOTES on Kapok fiber. Paper xvi, No. 22, 19 (Aug. 11, 1915).
SCHWALBE, C. G., and TROELTZSCH, R. Kapok fiber. Tropenpflanzer xvii, 655-660 (1913); Paper Maker xlvii, No. 3, 434 (Mar. 2, 1914); Paper xiii, No. 19, 21 (Jan. 21, 1914); C. A. viii, 1204.
Strother, 1883.
Watt, vol. I, page 490.

Eriophorum cannabinum. Cotton grass.
PEAT in papermaking. Pulp Paper Mag. Can. ii, 294-295 (Oct., 1904).
Piette.

Eriophorum capitatum.
Mueller, L., 1877.
Munsell.

Eriophorum comosum.
Dodge, C. R., 1897, page 161.
Spon, vol. I, page 948.

Eriophorum daunabacum.
van den Corput.

Eriophorum latifolium.
Dodge, C. R., 1897, page 162.
Hannan, page 130.
Lindsay, 1858.

Ervum lens.
Mueller, L., 1877.

Eryngium.
Hannan, page 133.
Spon, vol. I, page 948.

Erythroxylon guttafereae.
Davis.

Esclepias. See *Asclepias.*

Esparto. See *Lygeum spartum.*
See *Stipa tenacissima.*

Eucalyptus.
EUCALYPTUS for papermaking. Paper xxiv, 116 (April 2, 1919).

Eucalyptus—Continued

HILTNER, R. S. Eucalyptus as a papermaking material. Paper Trade J. lii, 56 (May 11, 1916).

Lightfoot.

PAPER pulp from eucalyptus. Paper Making xxx, 376; Paper vi, No. 3, 15 (Jan. 3, 1912); C. A. vi, 803.

PORTEMONT, J. MICOL de. Eucalyptus as a source of paper. Papier xxii, No. 1, 17 (1919); C. A. xiii, 1149.

STOCK, W. Papermaking. English Patent 25,393. Nov. 1, 1910. C. A. vi, 1672; J. Soc. Chem. Ind. xxx, 1375.

Eucalyptus amygdalina.
Mueller, 1867, page 30.

Eucalyptus corymbosa. Bloodwood tree.
Mueller, 1867, page 30.

Eucalyptus fissilis. Messmate.
Watt.

Eucalyptus globulus.
Dodge, C. R., 1897, page 163.
Hiltner, 1911.
Mueller, 1867, page 30.
Phillips, 1915, page 259.
Watt.

Eucalyptus gonycalix.
Dodge, C. R., 1897, page 163.
Mueller, 1867, page 30.

Eucalyptus leucoxylon.
Dodge, C. R., 1897, page 163
Mueller, 1867, page 30.

Eucalyptus longifolia.
Dodge, C. R., 1867, page 163.
Mueller, 1867, page 30.

Eucalyptus obliqua. Stringy bark. Gigantic gum tree.
Dodge, C. R., 1867, page 162.
Mueller, 1867, page 29.
Phillips, 1915, page 259.

Eucalyptus rostrata.
Dodge, C. R., 1897, page 163.
Hiltner, 1911.
Mueller, 1867, page 30.

Eucalyptus stuartiana.
Dodge, C. R., 1897, page 163
Mueller, 1867, page 30.

Eucalyptus tereticornis.
Hiltner, 1911.

Eucalyptus viminatis.
Hiltner, 1911.

Eulalia. Japanese grass.
Mueller.

Eulalia japonica.
Brand, 1911.
Montessus de Ballore, page 276.

Euonymus. Spindle tree.
Davis.

Euphorbia.
Juritz, page 75.

Everlasting. See *Gnaphalium.*

EXPERIMENTS with new material for the manufacture of paper.
Bull. Imp. Inst. x, 372-379 (1912); Papier-Ztg. xxxvii. 3537-3538; J. Soc. Chem. Ind. xxxi, 1074; C. A. vii, 1286.

F

Fagopyrum esculentum. Buckwheat. Brank.
JAPANESE buckwheat pulp. Pulp Paper Mag. Can. vi, No. 11, 303 (Nov., 1908).
McElhenie, 1910.
NEW fibers. World's Paper Trade Rev. li, No. 1, 6 (1909).
Watt.

Fagus silvatica.
Fagus, book paper pulp. Papier-Ztg. xxxiv, 3676-3678, 3806 (1909).

False hedge. See *Carex pseudocyperus.*

Fan palm. See *Coryphia umbraculifera.*

Fatsia papyrifera. (*Aralia papyrifera.*) Rice paper plant.
Dodge, C. R., 1897, page 164.
Liotard.
PAPERMAKING in China. Paper Trade J. xxix, No. 14, 430 (Aug. 31, 1899).
Valenta, 1904.

FAVIER, E.
Plants of Madagascar adapted to the manufacture of paper. Moniteur, June 15, July 1, 1914.

Fenequen.
Davis.

Fennel, giant. See *Foeniculum.*

Festuca erica. Gypset.
BOY, P. Gypset for obtaining textile material or paper pulp. French Patent 350,117. Aug. 16, 1904. J. Soc. Chem. Ind. xxiv, 1169.

Festuca patula. Diss.
Mierzinski, page 14.
Piette.

Few flowered rush. See *Juncus pauciflorus.*

FIBER plants for paper investigated by the United States.
Paper Makers' Mo. J. li, No. 7, 305-306.

Fibrila. Flax cotton.
Davis.
Dodge, C. R., 1897, page 166.

Ficus bengalensis. Banyan tree.
Cross, Bevan, and King, page 53.
Dodge, C. R., 1897, page 166.
Liotard.

Ficus glomerata. Glomerous fig tree.
Liotard.

Ficus indica.
Liotard, page 7.

Ficus morus. Mulberry.
Liotard.

Ficus natalensis.
Juritz, page 76.

Ficus racemosa. Indian fig.
Liotard.

Ficus religiosa. Peepul tree.
Liotard.

Ficus speciosa.
Royle.

Fig tree. See *Ficus.*

Fimbristylis spadicea.
Dodge, C. R., 1897, page 166.

Fir cones.
Davis.

Fire weed. See *Epilobium angustifolium.*
See *Erecthites heracifolia.*

Flag. See *Iris.*
See *Typla.*

Flame tree. See *Sterculis acerifolia.*
See *Sterculis foetida.*

Flax. See *Linum usitatissimum.*

Flax-cotton. See *Fibrila.*

Fleabane. See *Erigeron.*

Fleurya peduncularis.
Leighton, 1918.

Floss silk.
Archer.

Foeniculum. Giant fennel.
Charpentier, page 29.

Forster's palm lily. See *Cordyline australis.*

Fourdrini.
Davis.

Fox grass. See *Spartina juncea.*

FRANCE'S resources in papermaking materials.
Paper xxii, 512-513 (July 10, 1918).

Fresh water cord grass. See *Spartina cynosuroides.*

Freycinetia banskii. Kickie.
Dodge, C. R., 1897, page 168.
Spon, vol. I, page 948.

Ftomenteau. See *Baldengera arundinacia.*

Fucaceae. See *Laminarieae.*

Fucus vesiculosus. Marine algae. Varec. **Rock weed. Kelp.** Sea wrack. Wrack.
Davis.
See also *Kelp.*
See also *Alga marina.*

Furcraea gigantea. Giant lily. Mauritius hemp.
Dodge, C. R., 1897, page 169.
FIBERS from different sources. **Bull. Imp. Inst. xv, 7-23** (1917).
Griffin and Little.
Juritz, page 80.
SOUTH American jute substitute. **Papier-Ztg. xliii, 2252**; Z. angew. Chem. xxxi, No. 94, 598 (1918).

Furze. See *Ulex europaenus.*

G

Gahnia decomposita.
Lightfoot, Bull. No. 11, page 34.

Gahnia erythrocarpum.
Davis.

Gahnia psittocorum. Sword grass.
Davis.
Phillips, 1915, page 257.

Gahnia radual. Black reed.
Dodge, C. R., 1897, page 170.

Gahnia trifida. Awned saw edge.
Lightfoot, Bull. No. 11, page 33.

Galangal. See *Cyperus lucidus.*

Galega officinalis. Goat's rue.
Davis.

Galega orientalis. Goat's rue.
Gillet-Damitte, 1869.
Hannan, page 127.

Galingale. See *Cyperus lucidus.*

Galingale rush. See *Carex pseudo-cyperus.*

Gampi. See See *Wickstroemia canescena.*

Ganga. See *Cannabia sativa.*

Ganpi. See *Wickstroemia canescena.*

Garbage.
PUTTAERT, J. F., and PUTTAERT, H. F. J. Pulp and paper from garbage. U. S. Patent 1,294,163. Feb. 11, 1919. English Patent 134.411. Dec. 16, 1918. Paper Maker liv, No. 4, 348 (Oct. 1, 1917); C. A. xiii, 1149; xiv, 840.

Garlic. See *Allium sativum.*

Geld. See *Marsdania tenacissima.*

GELDER, ZONEN, van.
Een woord over nieuwe grondstoffen voor papier, mit monsters van der proeven, . . . half stroo, half sparte. Amsterdam, 1866.
12 p. 32 ll. of specimens. sm. 40°.
Statement about new materials for paper, with test specimens . . . half straw, half esparto.

Genista.
Schaeffer, 1772.

Genista aculenta. Spanish broom.
Piette.

Genista germania.
Mueller, L., 1877.

Genista scoparia. See *Cytisus scoparium.*

Genista tinctoria.
Mueller, L., 1877.

GERMANS searching for new fibers.
Paper Trade J., May 12, 1910, page 40.

Giant ascelpias. See *Calotropis gigantea.*

Giant lily. See *Furcraea gigantea.*

Giant maize.
BAUDOX, CHESNON, and VIDAL, L. Tests made in the laboratory of the French school of papermaking in the use of giant maize of Serbia, now being acclimated to Southern France. Moniteur xlvii, No. 8, 177 (Apr. 15, 1911); Paper iii, No. 11, 34 (May 31, 1911).

Giant millet. See *Kaoling.*

Giant nettle. See *Laportea giga.*
See *Urtica divaricata.*

Giant seaweed. See *Macrocystis pyrifera.*

Giant spear grass.
Hanausek, 1911.

Giant spinach.
Giant spinach for papermaking. **Paper Trade J. li, No. 13,** 38 (Sept. 29, 1910); Paper Makers' Mo. J. xlviii, No. 8, 285 (Aug. 15, 1910).

Giant wild plantain. See *Ravenala madagascariensis.*

Gigantic climber. See *Bauhinia vahlii.*

Gigantic gum tree. See *Eucalyptus obliqua.*

Ginger. See *Zingiber officinalis.*

Girardina heterophylla. Neilgherry nettle.
Liotard.
Mueller, L., 1877.

Glyceria aquatica. Marsh grass. Reed grass.
Davis.
Little, 1908.
STRONG, F. F. New source of paper supply. **Paper** Trade J., Feb. 20, 1913, page 313.

Glycerhiza glabra. Licorice root.
van den Corput.
Hannan, page 126.
Lindsay, 1858.
Mueller, L., 1877.

Gnaphalium. Cudweed. Everlasting.
Lindsay, 1858.
Munsell.

Gnerium argenteum. Pampas grass.
Dodge.

Gnidia erocephala.
van den Corput.
Mueller, L., 1877.

Goat's rue. See *Galega.*

Goldenrod. See *Solidago.*

Gombo. See *Hibiscus esculentus.*

Gorse. See *Ulex europaenus.*

Gossypium. Cotton.
The manufacture of paper from the cotton fiber is too well known to give references; its use is discussed in all the standard works on papermaking.
The following references refer to the use of the cotton plant and cotton linters as raw materials for paper pulp.

Gossypium. Cotton plant. Cotton stalk.

Brand, 1911.

COLEMAN, JAMES C., and TOXEY, ELLIOTT. Pulp from the entire cotton plant. Paper Makers' Mo. J. xli, No. 6, 196 (June 15, 1903).

COTTON stalk fiber for paper. Paper Making xxvi, No. 1, 41 (Jan., 1907).

COTTON stalk paper. Paper Making xxxvi, No. 8, 251-253.

COTTON stalk paper. World's Paper Trade Rev. lxvi, No. 9, 40.

COTTON stalks as raw materials. Paper Makers' Mo. J. xlv, No. 3, 97-98 (Mar. 15, 1907); Paper Making xxvi, No. 5, 225-226 (May, 1907).

COTTON stalks as raw material for paper. Papier-Ztg. xxxiv, 147 (1909).

COTTON stalks for the manufacture of paper. Paper Makers' Mo. J. xliv, No. 8, 264-265 (Aug. 15, 1906).

CROLL, W. H. Making paper pulp from cotton stalks. U. S. Patent 1,165,323. Dec. 21, 1915. C. A. x, 369; J. Soc. Chem. Ind. xxxv, 250.

GOOD paper from cotton stalks. Paper Trade J. li, No. 11, 60 (Sept. 15, 1910).

GOOD things now claimed for cotton stalk fiber. Paper Trade J., Aug. 15, 1915, page 9.

JONES, L. D. Process of treating cotton stalks. U. S. Patent 1,257,080. Feb. 19, 1918. J. Soc. Chem. Ind. xxxvii, 238A.

KITHIL, KARL L. Use of cotton stalks for papermaking. U. S. Patent 986,551. Mar. 14, 1911. Paper vi, No. 5, 15-16 (Jan. 17, 1912).

LITTLE, ARTHUR D. Cotton stalk paper fallacy. Manufacturers Record; Paper xix, No. 2, 16 (Sept. 20, 1916).

MARSDEN, M. W. Method of utilizing waste substances of the cotton plant. U. S. Patent 1,143,587. June 15, 1915. Paper xvii, No. 5, 19-20 (Oct. 13, 1915); J. Soc. Chem. Ind. xxxiv, 830; C. A. ix, 2311.

MARSDEN, M. W. Obtaining fiber and by-products from cotton stalks, cane, etc. U. S. Patent 1,165,689. Dec. 28, 1915. C. A. x, 693.

MARSDEN, M. W. Papermaking fiber. U. S. Patent 1,251,261. Dec. 25, 1917. C. A. xii, 533.

MAY, E. L. New use for the cotton plant. Country Life xxx, 12 j, 12, 1 (Oct., 1916).

NANSON, W. B. Paper pulp from cotton stalks. Paper

Gossypium—Continued

Making xxxv, No. 12, 371-374 (1916); J. Soc. Chem. Ind. xxxvi, 131.

OLDS, W. C. Utilizing cotton stalks. J. Roy. Soc. Arts lxiii, 580 (1915); C. A. ix, 2708.

PAPER from cotton stalks. Paper Makers' Mo. J. xlvi, No. 6, 204-205 (June 15, 1908).

PAPER from cotton stalks. Paper Trade J. xliii, No. 17, 20 (Oct. 25, 1906); li, No. 11, 60 (1910).

PAPER from cotton stalks. Sci. Am. cxv, 241 (Sept. 9, 1916).

PRICE, W. J., and CRANDALL, ROY. Cotton and corn to solve our paper problem. Tech. World Mag. x, 637-643 (Feb., 1909).

PULP from cotton stalks. Dallas Trade Rev. Ind. Record xxi, No. 7, 8 (1916).

TEXAS experiments with papermaking from cotton stalks. Manufacturers Record lxxii, Sept. 6, 1917, page 74.

TIGNER, R. S. Papermaking from cornstalks and cotton stalks. Van Norden Mag. iv, 352-357 (Dec., 1908).

TO USE cotton stalks. Paper Trade J. xlii, No. 26, 5 (June 28, 1906).

USE of cotton stalks to prevent depletion of our forests. Paper Trade J. lviii, No. 7, 40-42 (Feb. 12, 1914); C. A. viii, 1503.

USES cotton stalks as raw material. Paper Trade J. xliv, No. 7, 30 (Feb. 14, 1909).

Walsh 1917.

YARN and paper stock from cotton stalks. Fiber and Fabric lxv, 12-13 (Jan. 13, 1917).

Gossypium. Cottonseed hulls and cotton linter.

ARMISTEAD, W. T. Manufacture of paper. U. S. Patent 719,982. Feb. 10, 1903. J. Soc. Chem. Ind. xxii, 377.

BEADLE, C., and STEVENS, H. P. By-products of cottonseed and their utilization. J. Soc. Chem. Ind. xxviii, 1015-1020 (Oct. 15, 1909); Paper Trade J. 1, No. 4, 52; Paper Maker xxxvii, 713 (1909); C. A. iv, 1100.

BEADLE, C., and STEVENS, H. P. Cotton fibers. Paper Mill, June 15, 1907.

BEADLE, C., and STEVENS, H. P. Investigation to determine the papermaking qualities of short cotton fibers. Chem. News xcv, 193-199 (Apr. 19, 1907); World's Paper Trade Rev. xlvii, 905-907 (May, 1907); Papierfabr. viii, 327,329 (1910); Papier-Ztg. xxxv, 530 (1910); J. Soc. Chem. Ind. xxvi, 548; C. A. iv, 1100.

Gossypium—Continued

BOCKMEYER, —. Treating cottonseed hulls or cotton wastes. U. S. Patent 759,800. May 15, 1904.

Brand, 1911

BRODE, J. L. Papermaking materials. Complete separation of the lint from the cottonseed. Monthly Consular and Trade Reports, No. 3667, 7 (Dec. 22, 1909).

COTTON hull fiber. World's Paper Trade Rev. lvii, No. 16, 794-795 (Apr. 19, 1912).

COTTON linters for papermaking. Paper Maker lvii, 663 (June 2, 1919).

COTTONSEED fibers. Paper Trade J. xxxi, No. 25,773 (Dec. 20, 1900).

COTTONSEED hull fiber. Paper Makers' Mo. J. xlvi, No. 5, 166 (May 15, 1908); Paper Trade J., May 7, 1908.

COTTONSEED hull fiber. Paper Trade J., Oct. 10, 1907; Paper Makers' Mo. J. lv, No. 12, 420-421 (Dec. 16, 1907).

COTTONSEED hulls as paper stock. Paper Makers' Mo. J. xlvi, No. 7, 230 (July 15, 1908).

COTTONSEED hulls as a papermaking material. Paper Maker liv, No. 3, 240 (Sept., 1917).

COTTONSEED hulls as a substitute for wood. Paper Makers' Mo. J. xlvi, No. 2, 48 (Feb. 15, 1908).

CROSS, C. F. Treatment of cottonseed hulls. English Patent 8,545. Apr. 13, 1904. J. Soc. Chem. Ind. xxiv, 288.

ENGLISH company to make paper of cottonseed hulls. Paper Mill xxiv, No. 51, 28 (Dec. 21, 1901).

FAVORABLE reports on cotton hull fiber. Paper xxv, 32 (Sept. 10, 1919).

HIGH grade paper from second cut cotton linters. Papeterie xli, 411 (Oct. 10, 1919); Paper Maker lviii, No. 2, 175 (Aug. 1, 1919); Paper xxv, 658.

HULL fiber. Paper Mill, Mar. 30, 1912.

JOHNSON, W. C. Bleached pulp from cottonseed hulls. U. S. Patent 733,969. July 21, 1903. J. Soc. Chem. Ind. xxii, 961.

KNOPF, C., and BAUMWOLL-WERKE, BREMER. Treating cottonseed hulls and other waste products. English Patent 12,650. J. Soc. Chem. Ind. xxv, 217.

KRESS, OTTO. Cooking cotton hull fiber for pulp. The suitability of cotton hull fiber for pulp and paper manufacture. Paper xxv, No. 20, 964-968; No. 21, 1009-1011 (Jan. 21, 28, 1920); Pulp Paper Mag. Can. xviii, No. 4, 71-73; No. 5, 99-100; No. 6, 137-144 (Jan. 22-Feb. 5, 1920); Paper Ind. i, No. 12, 1127-1134 (Mar., 1920).

Gossypium—Continued

KRESS, OTTO. Cotton hull fiber for the paper trade. Cotton Oil Press iii, No. 12, 33-40 (1920); C. A. xiv, 2706.

KRESS, OTTO, Suitability of cotton linters in parpermaking. Paper Ind. i, No. 4, 267-270, 278 (June, 1919).

KRESS, OTTO, and WELLS, SIDNEY D. Pulp from cotton linters. Paper xxvi, No. 7, 62, 64, 66, 68 (Apr. 21, 1920).

KRESS, OTTO and WELLS, SIDNEY D. Pulping of second cut cotton linters. Some further mill trials. Paper Ind. ii, No. 3, 431-433, 460 (June, 1920).

KRESS, OTTO, and WELLS, SIDNEY D. Suitability of second cut cotton linters, cotton shavings, and hull fiber for papermaking. Paper xxiv, No. 15, 569-582 (June 18, 1919); C. A. xiii, 1927.

KRESS, OTTO, and WELLS, SIDNEY D. Utilization of delint for papermaking. Cotton Oil Press iii, No. 3, 27-36 (1919); Expt. Sta. Rec. xli, 734.

MARSDEN, M. W. Method of utilizing waste substance of cotton plant and products thereof. U. S. Patent 781,612. Jan. 31, 1905. J. Soc. Chem. Ind. xxiv, 208.

MUELLER, OSCAR. Cellulose substitute. U. S. Patent 930,874. Aug. 10, 1908. Papier-Ztg. xxxiv, 2711 (1909); C. A. ii, 2627.

NEW paper stock. Tradesman xlviii, No. 10, 67 (1903); Expt. Sta. Rec. xiv, 713.

NEWSONE, T. Cellulose from the cotton of the cottonseed husk. U. S. Patent 683,785. J. Soc. Chem. Ind. xxi, 63. English Patent 19,585. Oct. 1, 1901. Papier-Ztg. xxiv, No. 89, 3321 (1901).

PAPER from cottonseed hulls. Paper Trade J. xxxi, No. 19, 590 (Nov. 8, 1900).

PRODUCTION of cotton fiber for papermaking by the Segundo and Minck machine. World's Paper Trade Rev. liv, 521-523 (1910).

de SEGUNDO, E. C. Cotton hull fiber. World's Paper Trade Rev. lvi, No. 22, 1036 (Dec. 1, 1911).

de SEGUNDO, E. C. Cottonseed hull fiber now available. Paper Trade J. xlviii, No. 8, 24, 26, 30, 32 (Feb. 25, 1909), C. A. iii, 1458.

de SEGUNDO, E. C. Defibrating cottonseed hulls. Paper Trade J. xlviii, No. 24, 38, 42 (June 17, 1909); Paper Mill xxxii, No. 27, 13, 36 (July 3, 1909).

SUCCESSFUL cotton hull fiber. Paper Trade J. li, No. 13, 36 (Sept. 29, 1910).

Gossypium—Continued

VAKIL, K. H. Cottonseed products. J. Soc. Chem. Ind. xxxvi, No. 13, 685-692 (July 16, 1917); Paper xx, No. 24, 14 (Aug. 22, 1917).

WILBUSCHEWITSCH, M. W. Husks of cottonseeds for papermaking. English Patent 27,950. Nov. 30, 1909. Paper Making xxx, No. 1, 26 (Jan., 1911); J. Soc. Chem. Ind. xxx, 80.

WINTERS, S. R. Paper from cottonseed waste. Sci. Am. cxxii, 299 (Mar. 20, 1920).

Gossypium arboreum.

Dodge, C. R., 1897, page 174.
Griffin and Little, page 121.
Montessus de Ballore, page 213.
Spon, vol. I, page 948.

Gossypium barbadense. Sea Island cotton.

Dodge, C. R., 1897, page 174.
Griffin and Little, page 121.

Gossypium herbaceum. Short staple cotton.

Dodge, C. R., 1897, page 174.
Griffin and Little, page 121.

Gourd vine. See *Cucurbitaceae.*

Graminacea. See *Imperata cylindrica.*

Grapevine. See *Vitis.*

Grass.

GRASSES and reeds in papermaking. Paper Making xxxiii, No. 9, 347-350.

NEW sources of paper pulp. Papier xxii, 175 (1919); C. A. xiii, 2441.

PAPER pulp from grasses. Paper Makers' Mo. J. lvi, 264 (Sept. 16, 1918).

STEHLIN, C. V., and HAAN, H. A. Process of manufacturing paper from grass. U. S. Patent 144,294. Nov. 4, 1873.

Grass cloth plant. See *Boehmeria nivea.*

Grass tree. See *Xanthorrhea semiplana.*

Grass wrack. See *Zostera marina.*

Green aloe. See *Agave vivipara.*

Grewia oppositifolia.

Dodge, C. R., 1897, page 187.
Mueller, L., 1877.
Spon, vol. I, page 900.

Grewia tiliaefolia.

Dodge, C. R., 1897, page 187.

GRIFFIN, M. L. Search for fibers. Paper Trade J. lvi, No. 6, 131, 133, 135 (1910).

GRIFFIN, RUSSELL B., and LITTLE, ARTHUR DEHON.
The chemistry of papermaking, together with the principles of general chemistry; a handbook for the student and manufacturer. New York, H. Lockwood and Co., 1894.
vi, 517 p. illus., plates (1 fold.) diagr. 24½ cm.

GROUD, CH.
Aquatic plants and marsh grasses. Papier xxiii, 153-157 (1920); C. A. xiv, 2985.

Guazuma ulmifolia. Urania. Bastard cedar.
Dodge, C. R., 1897, page 188.

GUILFOYLE, WM. R.
Fibers from plants eligible for industrial culture and experiments in Victoria. Melbourne, 1894.

Gunny.
Archer.

Gutta percha tree.
Munsell.

Gynerium argenteum. Pampas grass.
Dodge, C. R., 1897, page 188.

Gypset. See *Festuca erica.*

H

Halfa. See *Stipa tenacissima.*

HANAUSEK, T. F.
Microscopy of some paper pulps. Papierfabr. ix, Fest und Auslandheft, 38-43 (1911); Paper iv, No. 12, 9-12 (Sept. 6, 1911); C. A. vi, 422; J. Soc. Chem. Ind. xxx, 1446.

HANAUSEK, T. F.
New grasses for papermaking. Paper vi, No. 9, 19 (Feb. 14, 1912).

HANNAN, WILLIAM I.
The textile fibers of commerce. A handbook of the occurrence, distribution, preparation and uses of the animal, vegetable, and mineral fibers used in cotton, woolen, paper, silk, brush, and hat manufacture. London, G. Griffin and Co., Ltd., 1902.
x, 236 p. illus. 23 cm.
Paper fibers, pages 125-140.

HARGREAVES, W. A.
An investigation into the prospects of establishing a papermaking industry in South Australia. South Australia, Dept. of Chemistry, Bull, No. 1, 1916. 56 pp.
Reviewed in: Paper Maker, Intern. No., 1916-1917, 11-21; Paper xx, No. 18, 16 (July 11, 1917); J. Soc. Chem. Ind. xxxvi, 27,

HAVIK, H. G. (1911).

Investigation of some raw materials for the manufacture of half stuff and paper in Java. Papierfabr. ix, No. 9, 145-147; No. 10, 274-277 (Mar. 3, 10, 1911); Paper iv, No. 12, 9-12 (Sept. 6, 1911); J. Soc. Chem Ind. xxx, 352.

HAVIK, H. G. (1912).

Papermaking materials in Java. Papierfabr. x, 859-863 (1912); C. A. vii, 1607.

Hawthorne. See *Crataegus.*

Hay.

Charpentier, page 30.

Heath. See *Calluna vulgaris.*

Heather. See *Calluna vulgaris.*

Hedychium coronarium.

BEADLE, C. Fiber for papermaking. U. S. Patent 1,286, 502. Dec. 3, 1918. Paper xxiii, No. 21, 569, 582; xxiv, 120; C. A. xiii, 379.

BEADLE, C. *Hedychium coronarium* in Brazil. Bull. Misc. Inform., Kew, 1917, No. 3, 105; Paper xxiii, 358; C. A. xii, 1834.

Beadle and Stevens, 1912, 1913.

BEADLE, C., and STEVENS, H. P. Addition of *Hedychium* pulp to chemical and mechanical wood pulp. Paper Maker xlviii, No. 3, 411-413; Pulp Paper Mag. Can. xii, No. 15, 453-454 (Aug. 1, 1914); Paper Trade Rev. lxii, No. 1, 42-46 (July 3, 1914); Chem. News cix, 280-281 (1914); J. Soc. Chem. Ind. xxxiii, 688; C. A. viii, 2946.

BEADLE, C., and STEVENS, H. P. Effect of mineral loading on the physical properties of *Hedychium* paper. Paper Maker xlvii, No. 2, 232-233 (Feb., 1914); J. Soc. Dyers Colourists xxx, 89-92 (1914); J. Soc. Chem. Ind. xxxiii, 308; C. A. viii, 1503.

BEADLE, C., and STEVENS, H. P. General characteristics of papers produced from *Hedychium coronarium.* Chem. News cix, 206-207 (May 1, 1914); Paper Maker xlvii, No. 6, 899-900 (June, 1914); World's Paper Trade Rev. lxi, No. 22, 1053-1054 (May 29, 1914); Paper xiv, No. 13, 15-16 (June 10, 1914); C. A. viii, 2946.

BEADLE, C., and STEVENS, H. P. *Hedychium coronarium.* Bull. Misc. Inform., Kew. 1914, No. 4, 165-167; Paper Maker xlvii, No. 2, 221-223 (Feb. 2, 1914); Paper Trade Rev. lxii, No. 6, 40; Wochbl. Papierfahr, xlv, 1377-1379 (1914); Papier-Ztg. xxxix, No. 23, 782-784 (Mar. 19, 1914); Bull. Imp. Inst. xii, No. 3, 487-488 (July-Sept., 1914).

Hedychium coronarium—Continued

BEADLE, C., and STEVENS, H. P. *Hedychium coronarium* from Calcutta. World's Paper Trade Rev. lxii, No. 6, 280 (Aug. 7, 1914).

BEADLE, C., and STEVENS, H. P. Papermaking qualities of the *Hedychium coronarium*. Orig. Com., 8th Intern. Congr. Appl. Chem. xiii, 39-45 (1912); Paper ix, No. 3, 17-19 (Oct. 2, 1912); x, No. 5, 17-19 (Jan. 5, 1913); World's Paper Trade Rev. lviii, No. 18, 861-864 (Nov. 1, 1912); C. A. vi, 3017; J. Soc. Chem. Ind. xxxi, 870.

BEADLE, C., and STEVENS, H. P. Technology of the paper industry. J. Soc. Chem. Ind. xxxii, 174-179 (1913); C. A. vii, 2306.

BOULT, A. J. Manufacture of paper, cardboard or other cellulose products. English Patent 29,582. Dec. 20, 1910. French Patent 422,064. Nov. 3, 1910. J. Soc. Chem. Ind. xxx, 485.

BRAZIL'S pulp wood resources. World's Paper Trade Rev. liii, 124; C. A. iv, 961.

COMPRESSION and density of papermaking raw materials. Paper Maker xlviii, No. 2, 247-249 (Aug. 1, 1914).

Juritz, page 76.

PAPER industry in Southern Brazil. Paper xiv, No. 6, 19 (Apr. 22, 1914).

Phillips, S. C., 1915, page 145.

ROBERTSON, W. H. New fiber for papermaking. Commerce Reports, No. 250, 369 (Oct. 25, 1915); Paper xvii, No. 8, 32 (Nov. 3, 1915); C. A. x, 274.

SOME new sources of paper fibers. Paper Maker li, No. 2, 163 (Feb. 1, 1916).

STEWART, C. J., HALL, H. D., and BEADLE, H. Treatment of certain plants for papermaking. English Patent 116,005. Sept. 22, 1917. Paper xxiii, No. 2, 31 (Sept. 18, 1918); C. A. xii, 1927; J. Soc. Chem. Ind. xxxvii, 409A.

TREATING green crops for papermaking. Paper xxii, No. 22, 611 (July 31, 1918).

WILLIS, JOHN. A new Brazilian plant for papermaking material. Paper Making xxxii, No. 11, 417 (Nov., 1913).

Hedychium flavescens.

Beadle and Stevens, 1912.

BEADLE, C., and STEVENS, H. P. *Hedychium flavescens.* Bull. Misc. Inform., Kew, 1914, No. 5, 193-194; World's Paper Trade Rev. lxii, No. 6, 260 (Aug. 7, 1914); Bull. Imp. Inst. xii, No. 4, 627-628 (Oct.-Dec., 1914); Paper Mill, July 31, 1915.

Heleocharis acuta. Slender spikerush.
Mueller, 1867, page 32.

Helianthus annus. Sunflower.
Dodge, C. R., 1897, page 189.
KIRCHNER, E. Sunflower. Wochbl. Papierfabr. xlvii, No. 42, 1861 (1916).
KNOSEL, TH. Sunflower stalks and nettle stems as paper materials. Papier-Ztg., 1916, No. 77, 1479.
McCORMACK, H., and McCULLEN, E. W. Paper pulp. U. S. Patent 1,196,708. Aug. 29, 1916. C. A. x, 2638; J. Soc. Chem. Ind. xxxv, 1009; Paper xix, No. 1, 17-18 (Sept. 13, 1916).
MARKET for sunflowers. Rhodesian Agr. J. xiv, 508-516 (1917); C. A. xii, 1834.
Mueller, L., 1877.
Piette.
SUNFLOWER stems as paper material. Papier-Ztg. xli, No. 74, 1410-1411 (1916).
SUNFLOWER stems from Rhodesia. Bull. Imp. Inst. xv 329-334 (1917); Paper Makers' Mo. J. lxi, No. 3, 75 (1918); C. A. xii, 1251; Paper xxii, 230; xxiii, 173.

Helianthus tuberosus. Jerusalem artichoke.
Dodge, C. R., 1897, page 189.
Lindsay, 1858.
Mierzinski, page 16.
Mueller, L., 1877.

Helichrysum.
Phillips, 1915, page 261.
See also Bull. Imp. Inst., 1909.

Heliconia bihai. Balizier.
Dodge, C. R., 1897, page 189.

Heliconia gigantea. Balizier.
Davis.

Helicteres isora.
Watt, vol. VI, part 1, page 108.

Heliocarpus americanus. "Cuanlahuac."
Dodge, C. R., 1897, page 189.
Strother, 1883.

Helyocrisum arenarium. Immortales.
van den Corput.
Piette.

Hemp. See *Agave.*
Cannabi sativa.
Hibiscus.
Musa.
Sanscvieria.

Henequen. See *Agave rigida.*

HERRING, RICHARD

Paper and papermaking, ancient and modern. With an introduction by the Rev. George Croly, London. Longman, Brown, Green and Longman. 1855.

xvi, 125 pp. 25 specimens of paper.

HERZBERG, WILHELM.

Papierprüfung. Eine Anleitung zum Untersuchung von Papier. 4, verm. und verb. Aufl. Berlin, J. Springer, 1915.

xii, 276 pp. illus. xxiii pl. 24 cm.

Testing of paper. A guide to the examination of paper. 4th enlarged and revised edition.

Hibiscus abelmoschus. Musk mallow.

Dodge, C. R., 1897, page 191.

Liotard, page 17.

Hibiscus arboreus. Mahaut tree. Mahoe. Mahagua. (*Paritium tiliaceum.*)

Dodge, C. R., 1897, page 191.

MAHAGUA tree as a source of fiber. Paper ix, No. 4, 19 (Oct. 9, 1912).

Mueller, L., 1877.

Hibiscus cannabinus. Ambari hemp. Deckanee hemp. Deccani. Ambaree. Suckanee hemp. Meshla. Mesta pat.

AMMON, P. Paper pulp in French West Africa. J. Offic. l'Africa occid. franc.: Paper Making xxviii, 437 (1909); J. Soc. Chem. Ind. xxviii, 1269.

Bull. Misc. Inform., Kew, Sept., 1887, page 19; Selected Papers, vol. I, page 274.

Dodge, C. R., 1897, page 192

Kirchner, vol. II, page 75.

Liotard.

Spon, vol. I, page 961.

VOURNASOS, A. C. Paper pulp. English Patent 17,348. July 22, 1914. C. A. xi, 539; J. Soc. Chem. Ind. xxxvi, 131 (1917).

Watt, vol. VI, part 1, page 108.

Hibiscus esculentus. (*Abelmoschus esculentus*). Okra. Gombo. Bhindi. Bhendi. Musk okro. Arrache.

Charpentier, page 31.

Dodge, C. R., 1897, page 194.

Hannan, page 134.

Liotard, pages 5, 7.

Munsell.

OKRA as a raw material. Paper Making xxviii, 88 (1909).

OKRA paper pulp. Paper Makers' Mo. J. xlvii, No. 2, 48; No. 5, 169; No. 6, 201 (Feb. 15, May 15, June 15, 1907).

Hibiscus esculentus—Continued

PAPER from okra. Papeterie xxxi, 435 (1909).

USE of cotton stalks and okra as raw material for paper in America. Papierfabr. ix, 650-651 (1911).

Hibiscus ficulneus. Bon-dheuras.

Watt.

Hibiscus heterophyllus.

Davis.

Hibiscus moscheutos. Swamp rose mallow.

CANTELLO, W. J. Application of the *Hibiscus moscheutos* to the manufacture of paper. U. S. Patent 35,215. May 13, 1862.

Davis.

Dodge, C. R., 1897, page 195.

Hibiscus mutabilis. Changeable hibiscus. Stalpoddo.

Dodge, C. R., 1897, page 196.

Piette.

Hibiscus palustris.

Davis.

Hibiscus rosa sinenis. Chinese rose. Joba. Shoe flower.

Davis.

Liotard, page 34.

Mueller, L., 1877.

Hibiscus sabdariffa. Rozelle hemp. Meshta.

Dodge, C. R., 1897, page 196.

Liotard.

Watt.

Hibiscus splendens. Hollyhock tree.

Davis.

Dodge, C. R., 1897, page 197.

Lindsay, 1858.

Hibiscus syriacus.

Mueller, L., 1877.

Hibiscus tiliaceus. Lime tree leaved.

Hannan, page 134.

Liotard.

HILTNER, R. S.

Eucalyptus for papermaking. World's Paper Trade Rev. lii, No. 19, 52-56 (May 11, 1911).

HOFMANN, CARL.

Practical treatise on the manufacture of paper in all its branches. Philadelphia, H. C. Baird, 1873. iv, 398 p. illus. v. fold. pl. 29 cm.

Second ed., London, 1895-1899. pp. 1-432 only were published.

HOFMANN, CARL.

Praktisches Handbuch der Papierfabrikation. 2 umgearb. und vergrosserte Ausg. Berlin, Verlag der Papier-Zeitung, 1891-1897.

2 v., 1800 p. illus. x fold. pl. 28½ cm.

Practical manual of papermaking. 2nd revised and enlarged edition.

Hoheria populaca. Houdere.

Phillips, S. C., 1915, page 259.

HÖHNEL, FRANZ, Ritter von.

Die Mikroskopie der technisch verwendeten Faserstoffe. Ein Lehr- und Handbuch der mikroskopischen Untersuchung der Faserstoffe, Gewebe und Papiere. 2 Aufl. Wien und Liepzig, A. Hartleben's Verlag (1905).

viii, 248 p. illus. 23½ cm.

Microscopy of fiber materials used in manufactures. A textbook and manual of the microscopic examination of fiber material, fabrics and papers.

Hollyhock. See *Althea rosea.*

Hollyhock tree. See *Hibiscus splendens.*

HOOPER, D.

Indian fibers for papermaking. Annual report, Indian Museum. Industrial Section, 1909-1910, pages 35-36; J. Soc. Chem. Ind. xxix, 1198.

Hops. See *Humulus lupulus.*

Hordeum murinum. Rye grass. Darnel.

Lindsay, 1858.

Hordeum vulgare. Barley.

BARLEY straw for papermaking. Pulp Paper Mag. Can. v, No. 7, 162-163 (July, 1907).

Dodge, C. R., 1897, page 200.

MONTESSUS de BALLORE, H. de. Barley straw as raw material for paper. Moniteur; Papier-Ztg. xxxii, 1534-1535 (1907); Paper Makers' Mo. J. xlv, No. 8, 274 (Aug. 15, 1907); Paper Making xxvi, No. 5, 228 (May, 1907); C. A. i, 2489; J. Soc. Chem. Ind. xxvi, 633.

Schaeffer, 1772.

See also Straw.

Hornet's nest.

Schaeffer, 1772.

Horse-chestnut leaves.

Davis.

Horse-radish. See *Cochlearia amoracia.*
Nasturtium armoracia.

Horsetail grass. See *Dichelachne crinata.*

Houders. See *Hoheria populaca.*

HOYER, EGBERT von.

Die Fabrikation des Papiers nebst Gewinnung der Fasern aus Ersatzstoffen, inbesonders aus Holz, Stroh, und Alfa, sowie die Fabrikation der Pappe, des Buntpapiers, des Pergamentpapiers, der Tapeten, u. s. w., und Anleitung zur Prüfung des Papiers und seine Eigenschaften und Zusammensetzung. Braunschweig, F. Vieweg und sohn, 1887.

ix, 495 p. illus., fold. pl., diagrs. 22½ cm.

Manufacture of paper, preparation of fiber from substitutes, especially wood, straw and alfa; also manufacture of paste-boards, colored papers, parchment papers, wall papers, etc., and guide to the testing of paper with regards to its properties and composition.

HÜBNER, JULIUS.

Cantor lectures on paper manufacture. Delivered before the Society of Arts on Feb. 2-23, 1903. London, Society of Arts, 1903. 46 pp. 33 illus. 8°.

Humulus lupulus. Hops. Hop plant.

ALBERT, F. J. New fiber for papermaking. Commerce Reports, Oct. 25, 1915, page 361.

Archer, 1861.

Dodge, C. R., 1897, page 201.

DOWNS, G. W. Paper from used hops. Paper Maker xxvii, 827 (1909).

Hannan, page 126.

Lindsay, 1858.

Mierzinski, page 10.

MÜLLER, C. A., and WOLF, D. Bank note and deed paper, German Patent 259,093. Feb. 23, 1912. C. A. vii, 3026. French Patent 443,133. Apr. 29, 1912. J. Soc. Chem. Ind. xxxi, 1026. Wochbl. Papierfabr. xliv, 1602 (1913); Papier-Ztg. xliv, No. 35, 1322 (1913).

Piette.

REINKE, OTTO. Manufacture of fiber paper and red charcoal from hop vines. Chem.-Ztg. xxxix, 597 (1915); Sci. Am. cxiv, 130 (Jan. 29, 1916); C. A. ix, 2708; J. Soc. Chem. Ind. xxxiv, 1007.

ROBERTSON, W. H. New source of paper. Commerce Reports, Oct. 25, 1915, No. 250, 360-361; Paper xvii, No. 8, 32 (Nov. 3, 1915); C. A. x, 274.

Schaeffer, 1772.

Spon, vol. I, page 962.

SURETIES, C. Utilization of spent hops. English Patent 21,250. Sept. 25, 1906. J. Soc. Chem. Ind. xxvi, 1105.

Tolhausen, 1899.

Hymenachne myurus. Gamelote graa.
Valenta, 1904.

Hymenodictyon excelsum.
Dodge, C. R., 1897, page 201.
Liotard.

Hyphaene thebaica. Doum palm. Matova.
Davis.
Dodge, C. R., 1897, page 201.

I

Ife hemp. See *Sansevicra cylindrica.*

Immortales. See *Helyocrisum arenarium.*

Imperata arundinacea. Lalang grass. Blady grass. Savannah grass. Iluk.

BEADLE, C. Lalang grass. World's Paper Trade Rev. xlviii, 124-125, 164-165, 200 (1907); C. A. ii, 177.

EATON, B. J. Lalang grass as a paper material. Agr. Bull. Federated Malay, States vii, No. 1, 28-32 (1919); C. A. xiv, 1438.

HAYNES, T. Lalang as a papermaking material. Monthly Consular and Trade Reports, Apr. 5, 1909, No. 3447, 12-13.

INVESTIGATION of materials suggested for the manufacture of paper. Bull. Imp. Inst. xvii, No. 2, 155-157 (1919).

LALANG as a papermaking material. Paper Maker, Annual No., 1915-1916, page 32; World's Paper Trade Rev. lxvi, No. 26, 1114 (Dec. 29, 1916).

LALANG as paper material. Monthly Commerce and Trade Reports, June, 1909, 136-137; Papeterie xxxi, 548-551 (1909).

LALANG grass for paper fiber. Paper xix, No. 24, 17 (Feb. 21, 1917).

Lightfoot, Bull. No. 11, page 28.

Little, 1910.

PAPER pulp from lalang. Paper i, No. 1, 37 (Sept. 20 1910).

PAPER pulp from lalang. Paper Maker liv, 140 (Aug. 1, 1907).

Phillips, S. C., 1915, page 257.

Raitt.

REMINGTON, J. S., and BOWACK, D. Lalang grass as a papermaking material. World's Paper Trade Rev. 1, 713 (Oct. 30, 1908); Aynsome Annual, 1910, 5-11; Z. angew. Chem. xxii, 995 (1909); C. A. iii, 484.

REMINGTON, J. S., BOWACK, D., and CARRINGTON, H. J. B. Lalang. World's Paper Trade Rev. lii, No. 25, 1058 (Dec. 17, 1909); Aynsome Annual, 1910, 90-96; C. A. iv, 668. Richmond, 1911.

Imperata arundinacea—Continued

TROPICAL grasses as papermaking materials. Bull. Imp. Inst. xvi, No. 3, 271-275 (1918); Paper Maker, Intern. No., 1918-1919, page 45.

Wild Plants, etc., 1916.

Imperata cylindrica. Graminacea.

VIGNO-LUTATI, F. Use of *Imperata cylindrica* in papermaking experiments in Italy. Int. Rev. Sci. Pract. Agr. ix, No. 5, 615-617 (May, 1918).

VIGNO-LUTATI, F. Utilization of graminacea (*Imperata cylindrica*) of Tripoli. Ind. chim. xiii, 17-20, 195-197 (1913); C. A. vii, 1970, 3413; J. Soc. Chem. Ind. xxxii, 228.

VIGNO-LUTATI, F. Utilization of *Imperata cylindrica* P. B. in the paper industry. Ann. accad. agr. Torino lviii, 69-76 (1915); C. A. xi, 2962; Pulp Paper Mag. Can. xv, 1196.

Imperata exaltata. Cogon grass.

Boomer, 1919.

Brown and Fischer, Bull. No. 16.

Little, 1908.

RAW materials for paper. Paper Maker xxxviii, No. 1, 53, 55, 57, 59, 61 (July, 1909).

Richmond, 1907, 1908.

Sahlin, 1910.

Indian cotton wood. See *Bombax malabaricum.*

Indian fig. See *Ficus racemosa.*

Indian hemp. See *Apocynum cannabinum.*

Indian jute. See *Corchorus olitorius.*

Indian mallow. See *Abutilon avicennae.*

Indian paper birch. See *Betula bhojpattra.*

INDIAN paper pulp. Indian Textile J. xxiii, 420; Paper Making xxxii, 428, 430, 432.

Indian paper tree. See *Daphne involucrata.*

INDIAN papermaking materials. Paper Maker lii, 343 (Oct., 1916); Paper Making xxxv, No. 11, 311-312.

Indigo. See *Indigofera.*

Indigofera. Indigo.

Davis.

INVESTIGATING substitutes for wood. Paper Maker xlv, No. 2, 270 (1913).

Ipomoea albivenia. (Seed hairs.)

Fibers from different sources. Bull. Imp. Inst. xv, 7-23 (1917).

Iris ensata. (*Oxypetala*).

Phillips, S. C., 1915, page 148.

Iris pseudacorus. Yellow iris.

Archer.

Dodge, C. R., 1897, page 203.

Lindsay, 1858.

Spon, vol. I, page 962.

Iris versicolor. Marsh flag. Blue flag.

FLAG as a raw material. World's Paper Trade Rev., July 6, 1906; Paper Makers' Mo. J. xliv, No. 7, 229 (July 16, 1906).

PULP from flags. Pulp Paper Mag. Can. iv, No. 12, 290 (Dec., 1906).

TO USE flag as a raw material. Paper Trade J. xlii, No. 25, 16; No. 26, 6 (June 21, 28, 1906). See also issues of July 5, 21, Aug. 23, 30, Sept. 13, Oct. 18, 1906, for short notes on this subject.

Isatis tinctoria. Dyer's woad.

Davis.

Ischaemum angustifolium. Bhabur grass of India. Baib, Sabai. Bhaboi grass.

Bull. Misc. Inform., Kew, 1888, 157-160; 1894, 367; Selected Papers, vol. I, 253, 256.

Dodge, C. R., 1897, page 203.

Hannan, page 128.

Juritz, page 24.

MacMILLAN, H. R. Paper industry of the Indian empire. Paper xviii, No. 6, 15-18 (Apr. 19, 1916).

MANUFACTURE of paper pulp in India. J. Soc. Chem. Ind. xxxvi, No. 12, 630-632 (1917).

Phillips, S. C., 1915, page 143.

RAITT, WM. Indian fibers for papermaking. World's Paper Trade Rev. lix, 612 (Apr. 4, 1913); Paper xii, No. 3, 201 (July 2, 1913).

RAITT, WM. Indian forest products. Paper Maker liii, 417-421 (May 1, 1917).

RAITT, WM. New fibers for paper. Tropical Agriculturist xxxii and xxxiii (May-Aug., 1909).

RAITT, WM. Paper and pulp at the Allahabad exhibition. Papierfabr. ix, No. 5, 122-125 (Feb. 3, 1911); World's Paper Trade Rev. lv, No. 8, 321-322 (Feb. 24, 1911).

Watt, vol. VI, part 1, page 108.

Isolepis nodosa. River rush. Nodding rush.

Davis.

Phillips, 1915, page 257.

Ivory.

CLARK, W. N. Making paper from ivory. U. S. Patent 18,190. Sept. 15, 1857.

Munsell.

Ixora cuneifolia. Mulberry.
Davis.

J

JACKSON, JOHN R.
Commercial botany of the nineteenth century. A record of progress in the utilization of vegetable products in the United Kingdom, and the introduction of economic plants into the British colonies, during the present century. London, Cassell and Co., 1890.
3 p. l, 168 p. front. illus. 12°.
Chapter X, Paper materials, pages 123-131.

Jaggery palm. See *Caryota urens.*

JANVIER, ALBERT.
Notes on some new fibers. Papeterie xli, 482-486 (1919); C. A. xiv, 626.

Japanese grass. See *Eulalia.*

Japanese matting rush. See *Juncus effusus.*

Japanese millet.
PAPER from Japanese millet. Paper ii, No. 5, 21 (Jan. 25, 1911).

Japanese paper plant. See *Edgeworthis papyrifera.*

Jathropa manihot. Mandioc.
Davis.

Jerusalem artichoke. See *Helianthus tuberosus.*

Jerusalem thorn. See *Parkinsonia aculeata.*

Jew's mallow. See *Corchorus capsularis.*

Jimson weed. See *Datura stramonium.*

Joba. See *Hibiscus rosa-sinensis.*

Johnson grass. See *Sorghum halepense.*

Jubbulpore hemp. See *Crotalaria tenuifolia.*

Jucca. See *Yucca.*

Juncaceae.
Arnot.

Juncus effusus. Mat rush. Bingo-i.
Dodge, C. R., 1897, page 206.
Piette.

Juncus geeneri.
Davis.

Juncus maritimis. Seacoast rush.
Davis.
Phillips, S. C., 1915, page 257.

Juncus pallidus.
Dodge, C. R., 1897, page 208.

Juncus pauciflorus. Sheathed rush. Small rush. Common rush.
Dodge, C. R., 1897, page 207.
Guilfoyle.
Phillips, S. C., 1915, page 257.

Juncus roemeriarus. Salt marsh rush.
SALT marsh grass. Paper Trade J. xlviii, No. 6, 32 (1909); Paper Mill, Jan. 16, 21, 1909.

Juncus serratus.
Mueller, L., 1877.

Juncus vaginatus. Small sheathed rush.
Dodge, C. R., 1897, page 207.
Guilfoyle.
Mueller, 1867, page 32.
Phillips, S. C., 1915, page 257.

June grass. See *Poa pratensis.*

Juniperus. Juniper.
Davis.

JURITZ, C. F.
The grasses of the Eastern coast belt available for the manufacture of paper; and the possibility and prospects of papermaking in the Union of South Africa. Industries Bulletin Series, Bulletin No. 7. Pretoria, 1919. 115 pp. Abstracted in Paper xxvi, No. 16, 10, 28 (June 23, 1920), by C. J. WEST.

Jute. See *Corchorus capsularis.*

K

Kaffir corn.
BLISS, H. Kaffir corn (stems) paper worthless. Paper ii, No. 2, 28 (Dec. 28, 1910).
GRIMSHAW, ROBERT. Paper from straw of kaffir corn. Paper Makers' Mo. J. xlviii, No. 12, 429 (Dec. 15, 1910).

Kaing grass.
KAING grass of Burma. World's Paper Trade Rev. lxvi, No. 8, 307 (Aug. 25, 1916).
SINDALL, R. W. Burma raw materials. Paper Making xxvi, 409-411 (Sept., 1907); C. A. ii, 584; J. Soc. Chem. Ind. xxvi, 1157.

Kangra hemp. See *Cannabis sativa.*

Kaoliang. Giant millet.
CELLULOSE from millet stalks. Paper v, No. 4, 13 (Oct. 11, 1911).
KAOLIANG. World's Paper Trade Rev. lviii, No. 7, 335 (Aug. 16, 1912).
KAOLIANG fiber for papermaking. Moniteur; Paper vi, No. 7, 14 (Jan. 31, 1917).

Kaoliang—Continued

PAPER from kaoliang (giant millet). Paper Makers' Mo. J. xlviii, No. 12, 434 (Dec. 15, 1910).

PAPER pulp from Manchurian kaoliang. Paper viii, No. 2, 25 (June 26, 1912); C. A. vi, 2527.

PAPER trade in the Far East. Paper ii, No. 9, 71 (Feb. 15, 1911).

Kapok. See *Eriodendron anfractuosum.*

Karatas plumiere. Silk grass. Wild pineapple. Mexican fiber. Dodge, C. R., 1897, page 209.

Karri.

Australia seeks to develop paper industry. Paper xxiv, 531 (1919).

Kawa. See *Morus alba.*

Kelp. See *Fucus vesiculosus.*
Laminarieae.
Macrocystis pyrifera.

Khus khus. See *Andropogon squarrosus.*

Kickie. See *Freycinetia banskii.*

KIRCHNER, E.

Das Papier. I. Die Geschichte der Papierindustrie und allgemeines über Papier. 1897. 180 pp. II. Die Rohstofflehre der Papierindustrie. 1896. 160 pp. III. Die Halbstofflehre der Papierindustrie. Die Strohstoff- und Holzzellstofffabrikation. 1907. 652 pp.

KIRCHNER, E.

Papermaking fibers. Wochbl. Papierfabr. xl, 1968-1974; C. A. iv, 826.

Kittool. See *Caryota urens.*

KNÖSEL, TH.

Bamboo and rice straw cellulose. Wochbl. Papierfabr. xl, 1603-1604 (1909); Papier-Ztg. xxxiv, 1234 (1909); J. Soc. Chem. Ind. xxviii, 671.

Knot grass. See *Triticum repens.*

KOOPS, MATTHIAS.

Historical account of the substances which have been used to describe events and to convey ideas, from the earliest date to the invention of paper. 1st edition, London, 1800. 2nd edition, London, 1801. 273 pp. 1 plate of papyrus. 8 vo.

Koos.

Koos for papermaking. Pulp Paper Mag. Can. iii, No. 9, 258 (Sept., 1908).

Koosa. See *Andropogon squarrosus.*

Kozo. See *Broussonetia papyrifera.*

Kus kus. See *Andropogon squarrosus.*

Kydia calcycina.
Cross, Bevan and King, page 53.

L

Lace bark tree. See *Lagetta.*

Lagetta linteria. Lace bark tree.
Dodge, C. R., 1897, page 212.
FERRAND, J. New paper material. French Patent 327,046 Dec. 5, 1902. J. Soc. Chem. Ind. xxii, 879.
Höhnel, page 121.
Lindsay, 1858.
Spon, vol. I, page 962.
Wiesner.

Lagunaris patersonii. Cow itch tree.
Dodge, C. R., 1897, page 213.
Guilfoyle.

Lalang grass. See *Imperata cylindrica.*

Laminaria sacchatina.
Hannan, page 126.

Lanaria plumosa. Wild honden grass.
Juritz, page 89.

Lantern flower. See *Abutilon molle.*

Laportea giga. Nettle tree of Australia.
Dodge, C. R., 1897, page 213.

Laportea pectulata.
Mueller, L., 1877.

Lasiosiphon eriocephalus. *Lasiosiphon speciosus.*
Dodge, C. R., 1897, page 214.
Mierzinski, page 27.

Lasiosiphon speciosus. See *Lasiosiphon eriocephalus.*

Lauan, white.
Richmond, G. F., 1907.

LAUBOECK, G.
Japanese papers. Mitt. kgl. tech. Gew.-Mus. Wien, 1891, 257-260; 1893, 11; J. Soc. Chem. Ind. xi, 56; xii, 286.

Lavatera arborea. Tree mallow.
Dodge, C. R., 1897, page 213.
Guilfoyle.
Spon, vol. I, page 963.

Lavatera cretica. Algerian mallow.
VIDAL, L., and DOURON, E. Algerian mallow as paper-making material. Papeterie xli, 192-195 (July 25, 1919); Paper xxv, 587; C. A. xiii, 2442; Pulp Paper Mag. Can. xviii, No. 52, 1303 (Dec. 23, 1920).

Lavatera maritima. Sea mallow.
Guilfoyle.

Lavatera plebeia. Australian mallow.
Dodge, C. R., 1897, page 215.
Mueller, 1867, page 28.
Spon, vol. I, page 963.

Leather.

LEATHER cuttings for papermaking. Papier-Ztg. xxiii, 802 (1898); J. Soc. Chem. Ind. xviii, 485.

Leather plant. See *Celmisia coriacea.*

Leaves.

BRAMSON, K. Manufacture of paper pulp from dead leaves. Compt. rend. clxvi, No. 21, 853-854 (May 27, 1918); Paper Makers' Mo. J. lvi, 365 (Dec. 16, 1918); Sci. Am. cxix, 142 (Aug. 17, 1918); Papier-Ztg. xliii, No. 55, 1250 (1918); Wochbl. Papierfabr. xlix, No. 29, 1387 (1918); Am. Forestry xxiv, 630 (Oct., 1918); C. A. xii, 2053; Expt. Sta. Rec. xxxix, 808; J. Soc. Chem. Ind. xxxvii, 366A; Intern. Rev. Sci. Pract. Agr. ix, 1109.

BRAMSON, K. Paper pulp. French Patents 488,940, 488,941. English Patent 121,847. Jan. 9, 1919. Paper Maker lvii, No. 3, 289 (Mar. 1, 1919); Papier xxii, No. 1, 28 (Jan., 1919); Paper xxiv, 193,363; C. A. xiii, 906.
Griffin and Little.
Schaeffer, 1772.

Lechuguilla. See *Agave heteracantha.*

Lecythis grandiflora.
Wiesner.

Lecythis ollaria. Monkey pot.
Dodge, C. R., 1897, page 215.
Wiesner.

LEE, H. N.
Important fibers used in papermaking. Paper xvi, No. 20, 14-18 (July 28, 1915).

LEIGHTON, J.
Some suitable materials for papermaking. S. African J. Sci. xiv, 287-289 (1918); Chem. News cxvii, No. 3048, 199; C. A. xii, 2053.

Lentils.
Piette.

Lepidosperma elaitus. Coast sword rush. Tall sword grass.
Dodge, C. R., 1897, page 217.
Guilfoyle.
Phillips, S. C., 1915, page 257.

Lepidosperma flexuosum. Slender sword rush. **Mat grass.**
Dodge, C. R., 1897, page 216.
Guilfoyle.
Phillips, S. C., 1915, page 257.

Lepidosperma gladiatum. Sword sedge. **Coast sword rush.**
Dodge, C. R., 1897, page 217.
Earl, J. C., Bull. No. 1, 1916.
Lightfoot, Bull. No. 11, page 36.
Mueller, 1867, page 32.
Phillips, S. C., 1915, page 257.
Spon, vol. I, page 963.
TOLMER, ALEX. Proc. Roy. Soc. Victoria, 1860, page 208.

Libertia formosa.
Davis.

Libiscus cannabinus.
West African fibers for papermaking. Paper Makers' Mo. J. xlvii, No. 8, 274; World's Paper Trade Rev. lii, No. 1, 25 (1909).

Libitaceae.
Davis.

Lichens.
Munsell.

Licorice. See *Glycyrrhiza glabra.*

Ligeum spartum. See *Stipa tenacissima.*

LIGHTFOOT, GERALD.
Paper pulp—possibilities of its manufacture in Australia. Bull. Commonwealth of Australia. Adv. Council Sci. and Ind., No. 11. 1919. 39 pp. Reprinted or abstracted in: Paper xxiv, No. 19, 832-834; No. 21, 929-932; No. 22, 972-973; No. 23, 1014-1015; No. 24, 1061-1064; No. 25, 1100-1102; No. 26, 1141 (July 16-Sept. 3, 1919); Bull. Imp. Inst. xvii, No. 3, 415-421 (1919); C. A. xiii, 1530.

Liliacea.
Davis.

Lily of the valley. See *Convallaria.*

Lime tree. See *Tilia europaea.*

Linden. See *Tilia.*

LINDSAY, WM. LAUDER.
Substitutes for paper materials. Scottish Review, 1858, 289-303; 1859, 15-35. A long list of materials is given.

LINDSAY, WM. LAUDER.
Syllabus of lectures on substitutes for paper materials (Perth, Christie and Tainsh, printers, 186-). 7 pp. 22 cm.

Linseed stalks.

UTILIZATION of linseed stalks. Bull. Imp. Inst. xv, 481-485 (1917); Paper xxiii, 230; Pulp Paper Mag. Can. xvi, 959; C. A. xii, 1699.

Linters. See *Gossypium.*

Linum crepitans.

Kirchner, vol. II, page 65.

Linum regale.

Kirchner, vol. II, page 65.

Linum usitatissimum. Flax.

BIGGAR, E. B. Flax straw as a material for papermaking. Paper xx, No. 9, 13-14 (May 9, 1917); Pulp Paper Mag. Can. xv, No. 17, 411-412 (Apr. 26, 1917).

BLINN, M. H. Flax straw. Paper Making xxviii, No. 1, 31-32 (Jan., 1909); Paper Makers' Mo. J. xlvi, No. 3, 80-81 (Mar. 15, 1909); Paper Mill xxxii, No. 4, 30-32 (Jan. 23, 1909); Pulp Paper Mag. Can. viii, 244 (Aug., 1909); C. A. iii, 1590.

BOSWORTH, T. Few words on paper, flax, hemp, and plantin fiber—as substitute for—papermaking materials. London, 1885. 16 pp.

Brand. Circular 82.

COYNE, F. H. Flax straw paper. U. S. Patent 1,168,285. Jan. 18, 1916. C. A. x, 822.

Dodge, C. R., 1897, page 219.

FLAX paper. Moniteur xlvi, 35, 37 (1910).

FLAX pulp industry in Tunis. World's Paper Trade Rev. xlviii, 922 (Dec. 13, 1907); C. A. ii, 584.

FLAX straw and rag for writing paper. World's Paper Trade Rev. lxiii, No. 10, 372 (Mar. 5, 1915).

FLAX straw fiber. Pulp Paper Mag. Can. xi, No. 8, 265 (Apr. 15, 1913).

FLAX straw for pulp. Paper Makers' Mo. J. xlvii, No. 11, 386 (Nov. 15, 1909).

GREEN, H. G. Paper pulp. U. S. Patent 1,206,777. Nov. 28, 1916. C. A. xi, 210; Paper xx, No. 25, 18-19 (Aug. 29, 1917).

Griffin and Little, page 124.

Herring, 1855.

HICKMANN, F. Manufacture of flax pulp. English Patent 12,045. June 14, 1899. J. Soc. Chem. Ind. xviii, 942; Paper Trade J. xxix, No. 10, 314 (Aug. 3, 1899).

Kirchner, vol. II, page 65.

LEE, C. T. Treating vegetable fibers. U. S. Patent 713,116. Nov. 11, 1902. English Patent 23,964. Nov. 3, 1902. J. Soc. Chem. Ind. xxii, 42.

205534

Linum usitatissimum—Continued

LITTLE, ARTHUR D. Flax straw for papermaking. World's Paper Trade Rev. lxvi, No. 12, 482 (Sept. 22, 1916).

MANUFACTURE of paper pulp from flax straw. Agr. Ind. Progress Canada ii, No. 2, 21-23 (Feb., 1920); Pulp Paper Mag. Can. xviii, No. 14, 345-351 (Apr. 1, 1920); Paper Trade J. lxx, No. 16, 93-95, 99, 107 (Apr. 15, 1920); C. A. xiv, 2706.

MELCHERS, J. H. Paper pulp from flax straw. U. S. Patent 1,162,797. Dec. 7, 1915. C. A. x, 389.

MERRILL, JASON L. Paper pulp from straw, etc. U. S. Patent 1,145,498. July 6, 1915. World's Paper Trade Rev. lxiv, No. 10, 386 (Sept. 3, 1915); C. A. ix, 2589.

MERRILL, JASON L. Utilization of American flax straw in paper and fiber board industry. U. S. Dept. Agr., Bull. 322, Jan. 7, 1916. 24 pp. See also World's Paper Trade Rev. lxv, No. 6, 224 (Feb. 11, 1916); Papier-Ztg. xli, No. 22, 406 (1916); C. A. xi, 1299.

MONTESSUS de BALLORE, ANNE-MARIE de. Paper from flax straw and other plant fibers. U. S. Patent 921,502. May 11, 1909. Papier-Ztg. xxxiv, 2272 (1909).

Montessus de Ballore, H., page 229.

NEW pulping process for flax straw. Paper Making xxxvi, No. 10, 310; Pulp Paper Mag. Can. xvi, No. 3, 50 (Jan. 17, 1918).

PAPER from Tunisian flax straw. Paper iii, No. 9, 11 (May 17, 1911).

PULP from waste flax stalks. Paper vi, No. 10, 21 (Feb. 21, 1912).

SOC. ANON. POUR FABR. PATES PAPIER DE LIN ET SUCCEDANES. Preparing paper pulp from flax, etc. French Patent 365,046. J. Soc. Chem. Ind. xxv, 950.

Spon, vol. I, page 964.

Walsh, 1917.

LITTLE, ARTHUR D.

New sources of paper stock. Chem. Eng. vii, 106 (Mar., 1908); C. A. ii, 1489.

LITTLE, ARTHUR D.

Progress of the chemistry of papermaking. Paper vi, No. 10, 25-28 (Feb. 21, 1912).

LITTLE, ARTHUR D.

Raw materials. Paper Trade J., Convention No., 1910, 26 and following pages.

LITTLE, ARTHUR D. (1908).

Report of Arthur D. Little, official chemist of the American Paper and Pulp Association, read at the annual meeting, Feb.

Linum usitatissimum—Continued
6, 1908. 8 pp. See also, Publishers' Weekly lxxvii, No. 25. 2334-2335 (June 18, 1910).
LITTLE, ARTHUR D.
Wood pulp substitutes. Paper Making xxix, No. 10, 386-388 (Oct., 1910).
Livistonis mauritiana. Sago palm.
Davis.
Lolium perenne. Rye grass.
Davis.
Long cypress grass. See *Cyperus longus.*
Long moss. See *Tillandsia usneoides.*
Lophiomys (?).
Mueller, L., 1877.
Lucerne. See *Medicago sativa.*
Lucitodium equisetum.
Davis.
Lychnis coronata. See *Wichstroemia canescena.*
Lychnophora.
Davis.
Lye plant. See *Dombeya nataliensis.*
Lygeum spartum.
Dodge, C. R., 1897, page 230.
Griffin and Little, page 131.
Spon, vol. I, page 978.
See also *Stipa tenacissima.*

M

McELHENIE, T. D.
Weed papers. Paper Mill xxxiii, 21 (1910); C. A. iv, 1804
Macrochloea tenacissima. See *Stipa tenacissima.*
Macrocystis pyrifera. Kelp. Giant seaweed.
ANTHONY, CHARLES E. Kelp for making pulp. Paper Makers' Mo. J. xl, No. 2, 50 (Feb. 15, 1902); Paper Mill xxv, No. 2, 19 (Jan. 11, 1902).
Dodge, C. R., 1897, page 231.
KELP for papermaking. Paper Mill, Sept. 30, 1911, page 6.
Macrozamis apiralis. Zamis palm.
Lightfoot, Bull. No. 11, page 28.
Madagascariennis. Urania.
Davis.
Madar. See *Calotropis gigantea.*
Madder. See *Rubiaceae.*
Madran hemp. See *Crotalaria junceae.*
Maguey. See *Agave.*
Mahagua. See *Hibiscus arboreus.*

Mahaut tree. See *Hibiscus arboreus.*

MAIN, F.

Raw material for papermaking. J. agri. trop.; Paper Makers' Mo. J. xlvii, No. 5, 163-164 (May 15, 1909); World's Paper Trade Rev. li, No. 8, 297; C. A. iii, 1458.

Maize. See *Zea mays.*

Malachra rotundifolia.

Liotard, page 78.

Mallow. See *Abutilon avicennae.*
Althaea officinalis.

Maloo climber. See *Bauhinia racemosa.*

Malpighiceae.

Davis.

Malva castillo.

MEXICAN malva fiber. Paper Trade J. xliii. No. 10, 28 (Sept. 6, 1906).

Veitch.

Malva sylvestris. Mallow of India. Grand mauve.

LEROY, JULES E. New fiber. French Patent 482,023. Feb. 12, 1917, Pulp Paper Mag. Can. xvi, 73; Paper xxi, No. 21, 21.

Malvacea.

Guilfoyle.

Strother, 1883.

Mamaki bast. See *Pepturus albidus.*

Mandios. See *Jathropha manihot.*

Mangel wurzel. See *Beta vulgaris.*

Manila grass.

Hofmann, 1873, pages 317-321.

Manila hemp. See *Musa textilis.*

Manispernum.

Davis.

Maranta arundinacea. Arrowroot.

Davis.

von POSSANNER, —. Fibers from the German colonies for the manufacture of paper. Papierfabr., Fest- und Ausland Heft, 1912, 60-62; C. A. vi, 2527.

von POSSANNER, —. New raw materials for papermaking. Papierfabr. x, 60-61 (1912); Paper viii, No. 13, 27 (Sept. 11, 1912).

Marica northiana.

Davis.

Marine algae. See *Fucus vesiculosus.*

Marine fiber. See *Posidina australis.*

Marram grass. See *Ammophila arenaria.*

MARSDEN, M. W.

Papermaking fibers. U. S. Patent 1,251,261. Dec. 25, 1917. Paper xxii, 11.

MARSDEN, M. W.

Pulp from vegetable fibers. U. S. Patent 1,269,476 June 11, 1918. Paper xxiii, 358.

Marsdenia tenacissima. Rajmahal creeper. Geld.

Dodge, C. R., 1897, page 235.

Liotard.

Marsh flag. See *Iris versicolor.*

Marsh gladden. See *Scirpus lacustris.*

Marsh grass. See *Glyceria aquatica.*

Marsh mallow See *Althaea officinalis.*

Marsh rush. See *Juncus roemerianus.*
See *Scirpus palustris.*

MARTENS, N.

Manufacture of paper in Japan. Bull. soc. encour. ind. nat., 1889, 495-498; J. Soc. Chem. Ind. ix, 210.

Marzi.

Davis.

Masahual hibiscus.

Strother, 1883.

Mat grass. See *Cyperus variegata.*
See *Nardus stricta.*

Mat rush. See *Cyperus textilis.*

Mat rush of Japan. See *Juncus effusus.*

Matjesgoed fiber.

PAPER pulp from Cape fibers. Agr. J. Cape Good Hope xxxii, 208 (Feb., 1908); Paper Makers' Mo. J. xlvi, No. 4, 131 (Apr. 15, 1908); Paper Making xxvii. No. 5, 195 (May, 1908); Board Trade J., Mar. 26, 1908; J. Soc. Chem. Ind. xxvii, 352.

Juritz, page 80.

Matova. See *Hyphaene thebaica.*

Mauritius hemp. See *Fucraea gigantea.*

Mautia puya. Wild hemp. Pua hemp.

Dodge, C. R., 1897, page 235.

Rieder.

Mayapis. See *Anisopetera vidaliana.*

Mealie leaves.

PAPERMAKING from mealie leaves. Paper Making xxviii, No. 9, 354 (Sept., 1909).

Medicago sativa. Alfalfa. Lucerne.

LOTTERO, C. O. Pulp for paper or cardboard. U. S. Patent 1,341,991. June 1, 1920. C. A. xiv, 2263.

MATERIALS for board manufacture. Papierfabr. viii, 49-52.

Mierzinski, page 46.

SCHIAPPAPIETRA, S. Pulp for the manufacture of paper. French Patent 485,206. Dec. 20, 1917. C. A. xiii, 1929.

SUBSIDIARY materials for board making. Paper Making xxix, No. 3, 91 (Mar., 1910).

Medichey.

Davis.

Megass. See *Bagasse.*

Melaleuca armillaris. Tea tree.

Dodge, C. R., 1897, page 240.

Mueller, 1867.

Melaleuca eridifolia. Swamp tea tree.

Davis.

Mueller, 1867.

Melaleuca gentisifolia. Broom leaved tea tree.

Davis.

Melaleuca scurrosa. Victorian yellow wood.

Mueller, 1867.

Melastozaceae.

Davis.

Melic grass. See *Molinia caerulea.*

Melilotus alba. White sweet clover.

Dodge, C. R., 1897, page 240.

Melilotus arborea.

Piette.

Melocanna.

Raitt, 1912.

Melochia liliacefolia. Urania.

Davis.

Memorialis pentandra. Indian nettle. **Pousolsia.**

KAINDLER, —. Bamboo and pousolsia for papermaking. Paper Making xxv, 522-523 (Nov., 1906); J. Soc. Chem. Ind. xxv, 1114.

von POSSANER, —. Fibers from the German colonies for manufacture of paper. Papierfabr., Fest- und Ausland Heft, 1912, 60-62; C. A. vi, 2527.

Meshta. See *Hibiscus.*

Mesquite. See *Proconia juliflora.*

Messmate. See *Eucalyptus fissilis.*

Mesta pat. See *Hibiscus cannabinus.*

Mexican fiber. See *Agave heteracantha.*

See *Karalas plumiere.*

Mexican fiber silk grass. See *Nidularium karatas.*

Mexican whisk. See *Epicamps macroura.*

MICHETTE, FILICION.

Plants for papermaking. Compt. rend. agr. France iv, 142-146 (1918).

MIERZINSKI, STANISLAUS.

Handbuch der praktischen Papierfabrikation. Wien (etc.), A. Hartleben, 1886.

3 v. illus., 2 fold, pl. 18 cm. (on cover; A. Hartleben's chemisch-technische Bibliothek, No. cxxxviii).

Contents: Bd. 1. Die Herstellung des Papiers aus Hadern auf der Papier-Maschine. Bd. 2. Die Ersatzmittel der Hadern. Bd. 3. Anleitung zur Untersuchunge der in der Papierfabrikation vorkommenden Rohprodukte.

Handbook of practical papermaking.

Contents: Vol. 1. Manufacture of rag paper on the paper machine. Vol. 2. Substitutes for rags. Vol. 3. Guide to the examination of raw products for paper manufacture.

Milkweed. See *Asclepias syrica.*

Millet. See *Andropogon sorghum vulgaris.*

Mimosa bark.

WASTE materials for paper. Paper Maker lvii, 686.

Mitsumata. See *Edgeworthia.*

Mohaut tree. See *Hibiscus arboreus.*

Molinia coerulea. Melic grass. Blue moor grass. Mohiva.

Dodge, C. R., 1897, page 242.

Hannan, page 126.

Phillips, S. C., 1915, vol. 49, page 631.

Molucca palm. See *Nipa fruticans.*

Monkey bread tree. See *Adansonia digitata.*

Monkey grass. See *Para grass.*

Monkey pot. See *Lecythis ollaria.*

Monkey puzzle tree. See *Araucaria imbricata.*

MONTESSUS de BALLORE, HENRY de.

La fabrication des celluloses de papeterie autres que celle du bois. Description et traitment des principales plantes utilisables en papeterie. Paris, H. Dunod et E. Pinat, 1913.

Manufacture of paper cellulose other than that of wood. Description and treatment of principal plants that may be used in papermaking.

Moorva. See *Sansevieria.*

Morea tricuspis.

Phillips, S. C., 1915, page 261.

Morus alba. White mulberry. Kawa.

Dodge, C. R., 1897, page 243.

Haines, 1913.

Morus alba—Continued

JAPANESE papermaking. Foreign Office Diplomatic and Consular Reports, 1905, No. 635; J. Soc. Chem. Ind. xxiv, 937. Setlik, Papier-Ztg. xxxii.

Morus indica. Mulberry.

Liotard.

Morus nigra. Mulberry.

Mierzinski, page 6.

Morus papyrifera. Paper mulberry.

Piette.

Setlik, Papier-Ztg. xxxii.

Morus tartarica.

Davis.

Moschus.

WEST AFRICAN fibers for papermaking purposes. World's Paper Trade Rev. lii, No. 1, 25 (1909).

Mosses.

Charpentier, page 33.

Mothwort.

Schaeffer, 1772.

Mountain flax. See *Cordyline indivisa.*

Moya grass. See *Pennisetum alopecuros.*

Mudar. See *Calotropis gigantea.*

MUELLER, FERDINAND, *Freiherr von.*

Report on vegetable products (exhibited at the Inter-colonial Exhibition of 1866-1867). Melbourne, Blundell and Co., printers, 1867.

Paper, pages 27-34, 42, etc.

MUELLER, FERDINAND.

Select extra-tropical plants readily eligible for industrial culture or naturalization with indications of their native countries and some of their uses.

MUELLER, LOUIS, *i. e.,* FERDINAND ALBRECHT LOUIS.

Die Fabrikation des Papiers in Sonderheit des auf der Maschine gefertigten nebst grundlicher Auseinandersetzung der in ihr Vorkommenden chemischen Processe und Anweisung zur Prüfung der angewandten Materialien. 4 neu bearb. und verm. Aufl., Berlin, J. Springer, 1877.

xi, (1) 434 (1) p. illus. xi fold. pl. in pocket, tables. 26 cm.

Papermaking, especially by machinery, with a thorough explanation of the chemical processes involved and directions for testing materials.

Muguguboya bark.

INVESTIGATION of materials suggested for the manufacture of paper. Bull. Imp. Inst. xvii, No. 2, 148-150 (1919).

Mugwort. See *Artemisis vulgaris.*

Mulberry.

Special Consular Reports xix, page 384.

USHIJIMA, G. Treating mulberry fiber for papermaking. Japanese Patent 29,962. July 16, 1917. C. A. xii, 224; Pulp Paper Mag. Can. xvi, 278.

See also:

Alpina magnifica.
Cordia myxa.
Ficus morus.
Ixoro cuneifolia.
Morus.

Mummy cloth (Flax).

Dodge, C. R., 1897, page 244.

Munsell.

Mungongo. See *Ricinodendron rautanenii.*

Munja grass. See *Saccharum sara.*

MUNSELL, JOEL.

A chronology of paper and papermaking. Albany, 1856. 58 p. 31. 24 cm.

5th edition, with additions, 1876.

2 p. 1. 263 p. front. illus. 20 cm.

Musa banskii.

Mueller, 1867, page 33.

Musa ensete.

Lindsay, 1858.

Musanga smithii.

HERZBERG, W. Pulp woods from the Cameroons. Papierfabr. ix, 914-917, 948-950 (1911); C. A. vi, 3517.

SUGGESTED manufacture of pulp at Kamerun. Paper iii, No. 12, 26, 28 (June 7, 1911).

Musasa bark.

PAPERMAKING fibers from Africa. Paper xxi, No. 7, 22 (Oct. 24, 1917).

Musa paradisiaca. Plantain.

Boomer, 1919.

Bosworth, T. See under *Linum usitatissimum.*

Cross, Bevan, and King.

HANAUSEK, —. Mitt. Lab. Wiener Handelsakademie, 1889.

Liotard, page 52.

PEPELERA ESPANOLA. Paper. English Patent 123,093. Feb. 6, 1919. C. A. xiii, 1531.

Royle, 1855, page 389.

Musa sapientum. Banana.

BANANA fiber. Pulp Paper Mag. Can. v, No. 5, 108-109 (May, 1907).

BANANA leaves as raw material for paper. Papierfabr. vii, 551 (1909); Wochbl. Papierfabr. xl. 225 (1909).

Musa sapientum—Continued

BANANA paper. S. Am. J., July 21, 1890; J. Soc. Chem. Ind. ix, 829.

BEADLE, C. Paper from banana fiber. World's Paper Trade Rev. xlvii, 1-3 (Mar. 29, 1907); Paper Trade J. xliv, No. 15, 40, 44 (Apr. 11, 1907); C. A. i, 1621.

BEADLE, C., and STEVENS, H. P. Yield of paper on green stems of bananas. Chem. News cxii, 235 (1915); Paper Maker li, No. 1, 8 (Jan. 1, 1916); Paper xvii, No. 15, 11-12 (Dec. 22, 1915); World's Paper Trade Rev. lxiv, No. 23, 913-914 (Dec. 3, 1915); C. A. x, 527; J. Soc. Chem. Ind. xxxiv, 1204.

BLANCHIN, R. C. L. Pulp suitable for paper from the trunk and leaves of the banana tree. French Patent 493,305. Papeterie xli, 400-401 (Oct. 10, 1919); Paper xxv, 658.

Boomer, 1919.

Brown and Fischer, Bull. No. 16, page 9.

Bull. Misc. Inform, Kew, Apr., 1887, pages 5-8; Selected Papers I, page 97.

CHAPLIN, W. C. Manufacture of paper stock. French Patent 449,943. Oct. 21, 1913. C. A. vii, 3025.

Dodge, C. R., 1897, page 245.

Hannan, page 127.

HÜBNER, JULIUS. Banana fiber for paper. World's Paper Trade Rev. xlvii, 711 (Apr., 1907); Papier-Ztg. xxxii, 591 (Feb., 1907); C. A. i, 1621; ii, 458.

LOOMIS, BURDETT. Cellulose for papermaking. Paper Trade J., Feb. 19, 1914, page 253.

LOOMIS, BURDETT. Utilization of green stalks. Paper xviii, No. 9, 17 (May 10, 1916).

MADDOX, H. A. Banana stalks and their value. Paper v, No. 3, 9-10 (Oct. 4, 1911); Paper Maker xlii, No. 5, 753 (1911).

MARR, R. A. Cellulosic material. German Patent 263,315. June 11, 1912. C. A. viii, 248.

MEGASS for papermaking. Agr. News xviii, 205 (1919).

MOODY, H. R., and FRIEDBURG, L. H. Method of treating fibers. U. S. Patent 1,357,580. Nov. 2, 1920.

Norton, 1910.

PEPELERA ESPANOLA. Paper. English Patent 123,093. Feb. 6, 1919. C. A. xiii, 1531.

Richmond, 1906, pages 433 and 1075.

SINDALL, R. W. Banana fiber. Paper Makers' Mo. J. xlvii, No. 8, 272 (Aug. 16, 1909).

Spon, vol. I, page 982.

STEWART, C. J., HALL, H. D., and BEADLE, H. Processes and materials for papermaking. English Patent 116,005. Sept. 22, 1917. C. A. xii, 1927.

Musa sapientum—Continued

TAYLOR, C. M., and COOK, H. K. Paper pulp from banana fiber. U. S. Patent 1,181,553. May 2, 1916. C. A. x, 1790.

Watt, vol. VI, part I, page 108.

Musa sylvestris.

Piette.

Musa textilis. Abaca. Manila hemp. Wild plantain. Boon. Pisgang.

BOILING manila hemp. Pulp Paper Mag. Can. vi, No. 10, 271-272 (Oct., 1918).

Boomer, 1919.

Brown and Fischer, Bull. No. 16, page 9.

Cross and Bevan, page 113.

Dodge, C. R., 1897, page 248.

Griffin and Little, page 126.

IMAOKA, A. Paper from abaca bark. U. S. Patent 1,333,255. Mar. 9, 1920. C. A. xiv, 1439; Paper xxvi, 233.

Kirchner, vol. II, page 75.

Lindsay, 1858.

Liotard, page 48.

Little, 1908.

MANUFACTURE of paper from abaca bark. Paper xxvi, No. 6, 231 (Apr. 14, 1920).

Montessus de Ballore, page 278.

NORTON, T. H. Manila (hemp) rope paper stock. Monthly Consular and Trade Reports, May 7, 1910. 450-451; Paper Trade J., May 12, 1910, page 48.

Phillips, 1915, page 148.

Richmond, 1906, 1907.

Royle, 1855, page 87.

SKINNER, ROBERT P. Use of old rope. Monthly Consular and Trade Reports, Apr. 30, 1910, 410-411

Spon, vol. I, page 983.

Valenta, 1904.

Musa trogodytarium. Manila hemp.

Hübner, 1903, page 17.

Mierzinski.

Muscovy mats.

Munsell.

Musk mallow. See *Hibiscus abelmoschus.*

Musk okra. See *Hibiscus esculentus.*

Musk thistle. See *Carduus nutans.*

Mustard. See *Cruciferae.*

Mya grass.

Davis.

Myriaceae.

Davis.

N

Napal paper. See *Edgeworthia gardneri.*

Nardus stricta. Mat grass.

Lindsay, 1858.

Nasturtium armoracia. (*Cochlearia armoracia.*) Horse-radish.

Davis.

Lindsay, 1858.

Needle palm. See *Yucca brevifolia.*

Neilgherry nettle. See *Girardina heterophylla.*

Neoboutonia macrocalyx.

AFRICAN papermaking materials. Paper Maker liv, 329; Annual No., 1917-1918, page 73; Paper xxi, No. 7, 22 (Oct. 24, 1917).

SOME new papermaking materials. Bull. Imp. Inst. xv, No. 1, 1-7 (1917); Commerce Reports, No. 304, 1204 (Dec. 29, 1917); Paper Trade J. lxvi, No. 10, 46, 48 (Mar. 7, 1918); C. A. xi, 2962; Paper xxi, No. 21, 21.

Nepal paper plant. See *Daphne cannabina.*

Nettle. See *Boehmeria.*

See *Urtica.*

Nettle tree. See *Laportea giga.*

NEW fibers.

World's Paper Trade Rev. li, No. 15, 1 (1909).

NEW fibers for papermaking.

Pulp Paper Mag. Can. xiii, No. 22, 587-588 (Nov. 15, 1918).

NEW materials for papermaking.

Paper Trade J., Jan. 22, 1914, page 42.

NEW papermaking fibers.

Paper Maker li, 40-41 (Jan. 1, 1916).

NEW pulps.

Wochbl. Papierfabr. xliii, 3497-3498 (1912).

NEW raw materials for papermaking.

Papier-Ztg. xxxvii, 3537-3538 (1912); C. A. vii, 1286.

NEW sources of paper pulp.

Papier xxii, 173 (June, 1919); Paper xxv, 526.

New Zealand cabbage tree. See *Cordyline australis.*

New Zealand flax. See *Phorium tenax.*

Nicotiana. Tobacco.

ANTIGUEDAD, R. Manufacture of tobacco paper. U. S. Patent 105,160. July 12, 1870.

ARLEDTER, H. Manufacture of paper from tobacco waste, stalks, etc. English Patent 20,395. Sept. 14, 1911. J. Soc. Chem. Ind. xxxi, 981; C. A. vii, 890.

BAUDISCH, C. Is the tobacco plant suitable for papermaking. Wochbl. Papierfabr. xlii, 3817-3820; C. A. vi, 422.

CONSUEGRA, P. M., and ANTIGUEDAD, R. Manufacture of tobacco paper. U. S. Patent 92,427. July 13, 1869.

Nicotiana—Continued

DISKIN, M. B. Paper. U. S. Patent 914,394. Mar. 9, 1909. J. Soc. Chem. Ind. xxviii, 439; C. A. iii, 1459.

GIORDANO, F. Making tobacco paper from tobacco stems. U. S. Patent 999,986. Aug. 8, 1911. C. A. v, 3730.

HALE, H. J. Tobacco paper. U. S. Patent 46,233. Feb. 7, 1865.

Hofmann, 1873, page 322; 1897, page 1668.

MOONELIS, A. Paper made from tobacco fiber and extracts. U. S. Patent 1,016,844. Feb. 6, 1912. C. A. vi, 803.

Nidularium karatas. Mexican fiber silk grass.

Spon, vol. I, page 985.

Nipa fruticans. Nipa palm. Molucca palm.

Hannan, page 135.

NEW raw materials for papermaking. Papier-Ztg. xxxvii, 3537-3538 (1912).

NIPA palm leaves from Sarawak. Bull. Imp. Inst. xii, No. 1, 42-44 (1914); Paper xiv, No. 13, 2 (June 10, 1914); J. Soc. Chem. Ind. xxxiii, No. 9, 477 (1914).

Phillips, S. C., 1915, page 631.

Spon, vol. I, page 985.

Nipa palm. See *Nipa fruticans.*

Nodding rush. See *Isolepis nodosa.*

Nolina texana.

INVESTIGATING substitutes for wood. Paper x, No. 3, 19 (Jan. 1, 1913).

Nona. See *Anona reticulata.*

NORTON, THOMAS H.

Paper industry of Germany. Monthly Consular and Trade Reports, 1, 399 (1910); C. A. iv, 1906.

NORTON, THOMAS H.

Search for new fibers. Paper Makers' Mo. J. xlviii, No. 6, 216-217 (June 15, 1910); World's Paper Trade Rev. liii, 921-922 (1910).

NUNEZ, V. E.

Fibers proposed as substitutes for wood. Paper xiv, No. 20, 15-17 (July 29, 1914).

NUNEZ, V. E.

New sources of supply of raw material for paper pulp in the United States. Paper Maker xlviii, No. 6, 817-819 (Dec. 1, 1914).

NUNEZ, V. E.

Papermaking raw materials of the Southern States of America. Paper Maker xlviii, No. 3, 417-419 (Sept. 1, 1914); Papierfabr., Fest- und Ausland Heft, 1914, 41-48; Paper xv, No. 5, 15-17 (Oct. 14, 1914).

O

Oak. See *Quercus.*

Oats. See *Avena sativa.*

Ochlandra travancorica. Elephant grass.

BOURDILLON, T. F. Indian Forester xxv, 153 (1899).

ELEPHANT grass as papermaking material. Bull. Imp. Inst. xi. 68-70; Paper xi, No. 12, 24; Paper Makers' Mo. J. li, 210-211 (May 15, 1913); Paper Maker li, No. 5, 210-211; C. A. vii, 2471.

PAPER pulp from Uganda. Paper Maker l, No. 1, 70 (July 1, 1915).

Phillips, S. C., 1915, page 263.

Ochra. See *Hibiscus esculentus.*

Octanda stridulata. Wild bamboo.

PAPERMAKING in Ceylon. Paper Making xxviii, No. 11, 437 (Nov., 1909).

Ocymum pilosum.

Spon, vol. I, page 986.

Oenothea biennis. (?)

Setlik, B., 1907.

Okra. See *Hibiscus esculentus.*

OLD experiments with new paper fibers in England. World's Paper Trade Rev. li, No. 15, 1 (1909).

Olive waste.

OLIVE waste for papermaking. Zentr. oesterr-ungar Papierind. xxviii, 866 (1910); xxix, 241-242 (1911); Paper Making xxx, No. 5, 196 (May, 1911); World's Paper Trade Rev. lvi, 206; Paper iii, No. 6, 29 (Apr. 26, 1911).

OLMEDILLA y PUIG, J.

Noticias y dates acerca de la historia del papel. Madrid, 1891.

Onocarpus batava.

Davis.

Opuntia dillenii. Prickly pear.

Dodge, C. R., 1897, page 253.

Lightfoot, Bull. No. 11, page 30.

PAPER from the prickly pear. Paper Making xxvii, No. 10, 393-395 (Oct., 1908).

Phillips, S. C., 1915, page 259.

REMINGTON, J. S. Prickly pear as paper raw material. World's Paper Trade Rev. li, No. 16, 30 (1909).

Watt, vol. VI, part I, page 109.

Orach. See *Hibiscus esculentus.*

Orange pulp.

GIBBS, H. D., AGCAOILI, F., and DOVEY, E. R. Manufacture of paper from orange pulp. Philipp. J. Sci. vii, 411-412 (Dec., 1912).

Oryza sativa. Rice straw. Paddy straw.

Brand, Circular 82.

Brown and Fischer, Bull. No. 16, page 9.

Dodge, C. R., 1897, page 254.

EGYPTIAN rice straw used for pulp. Pulp Paper Mag. Can. xvii, 940 (1919); Paper xxv, 1106.

Hanausek, 1911.

Havik, 1911.

Kirchner, vol. II, page 58.

Knösel, 1909.

LIOTARD, MILLER W. Rice straw and bagasse for paper pulp. Paper xx, No. 20, 24 (July 25, 1917).

McElhenie, 1910.

Norton, 1910.

PAPER from rice straw. Paper Makers' Mo. J. xlvii, No. 11, 386 (Nov. 15, 1909).

PAPERMAKING prospects in Egypt. Paper xxv, No. 1, 13 (Sept. 10, 1919).

Piette.

PULP possibilities of rice straw. Paper xxiii, 203 (Oct. 30, 1918).

RICE straw for papermaking. Paper Maker lvi, 245-246 (Sept. 2, 1918); Pulp Paper Mag. Can. xvii, 224; Paper xxiii, No. 8, 203 (Oct. 30, 1918).

SINDALL, R. W. Burmese raw materials. Paper Making xxvi, 409-411 (Sept., 1909); C. A. ii, 584.

UTILIZATION of rice and its by-products. Bull. Imp. Inst. xvi, No. 1, 21 (1918).

Veitch.

VOLPATO, V. Preparing fiber from rice hulls, straw and the like. French Patent 484,762. Nov. 6, 1917. C. A. 12, 1124.

Walsh, 1917.

Osier. See *Salix alba.*

P

Paddy straw. See *Oryza sativa.*

Padi straw. See *Oryza sativa.*

Paja biava. Bog grass.

NEW paper industry in Argentina. Commerce Reports, No. 273, 799 (Nov. 19, 1920).

Palm. See Buri palm, etc.

Palmetto. See *Chamerops excelsa.*

Palungor. See *Hibiscus cannabinus.*

Pamiet. See *Prionium palmata.*

Palmyra palm. See *Borassus flabellifer.*

Palygaleae.

Davis.

Pampas grass. See *Arundo sellowiana.*
See *Gynerium argentum.*

Panama hat straw. See *Carludovica palmata.*

Pandanus odoratissimus. Caldera bush. Screw pine.
Archer, 1876.
Dodge, C. R., 1897, page 257.
Liotard.
Piette.
Spon, vol. I, page 986.
Watt, vol. VI, part I, page 5.

Pandanus utilis. Vacona.
Dodge, C. R., 1897, page 257.
Mueller, L., 1877.
Spon, vol. I, page 986.

Panicled acacia. See *Acacia leucophloea.*

Panicum myurus. Camelote.
Dodge, C. R., 1897, page 257.

Panicum obscurens.
INVESTIGATIONS of materials suggested for the manufacture of paper. Bull. Imp. Inst. xvii, No. 2, 147-148 (1919).

Panicum pyramidale. "Um soof."
JOSEPH, A. F., and MARTIN, F. J. Preliminary account of the chemistry of the Nile sudd. J. Soc. Chem. Ind. xxxix, 91-94T (1920); C. A. xiv, 2082.

Papaveriaceae. Poppy.
Davis.

Papaw. Anonaceae.
Papaw papermaking material. Paper Makers' Mo. J. xliii, No. 9, 325 (Sept. 15, 1915).

PAPER fibers from the Philippine Islands.
Paper Making xxvi, No. 5, 231-233 (May, 1907); Pulp Paper Mag. Can. v, No. 12, 171 (Dec., 1907); Paper Makers' Mo. J. xlv, No. 12, 419-420 (Dec. 16, 1907).

PAPER industry in Japan.
Wochbl. Papierfabr. xxxvi, 3029-3032 (Sept. 5, 1908); C. A. ii, 3282.

PAPER manufacture in Southern Brazil.
Paper Maker xlvii, No. 6, 841 (June 2, 1914).

Paper mulberry. See *Broussonetis papyrifera.*

PAPER pulp from Australian lalang grass.
Paper Makers' Mo. J. lv, 250 (Aug. 15, 1917).

PAPERMAKING fibers.
Paper Mill, Apr. 24, 1909; Paper Trade J., Apr. 22, 1909.

PAPERMAKING fibers in Brazil.
Paper Maker lv, 353 (Apr. 1, 1918).

PAPERMAKING in Australia.

Paper Maker liv, No. 6, 545-546 (Dec. 1, 1917); lvii, No. 6, 662 (June 2, 1919).

PAPERMAKING in Ceylon.

Paper Making xxviii, No. 11, 437 (Nov., 1909); xxx, No. 8, 301 (Aug., 1911).

PAPERMAKING in Japan.

Wochenschr. Papier Schreibwaren Handel, Aug. 11, 1918; Paper xxiii, 566.

PAPERMAKING materials.

Paper Makers' Mo. J. lii, 164-165 (May 15, 1914).

PAPERMAKING materials from South Africa.

Bull. Imp. Inst. xiv, 163-167 (1916); Paper Makers' Mo. J. liv, 302-303 (Oct. 16, 1916); World's Paper Trade Rev. lxvi, No. 14, 64; Paper Making xxxv, No. 10, 309-310.

PAPERMAKING materials in Australia.

Paper xxii, 323 (May 29, 1918); Paper Maker lvi, 350 (Oct. 1, 1918).

PAPERMAKING possibilities in Australia.

Paper Maker lii, No. 6, 528 (Dec. 1, 1916).

Papkuil fiber.

Juritz, page 82.

PAPER pulp from Cape fibers. Agr. J. Cape Good Hope xxxii, 208 (Feb., 1908); Paper Makers' Mo. J. xlvi, No. 4, 131 (Apr. 15, 1908); Paper Maker xxvii, No. 5, 195 (May, 1908); J. Soc. Chem. Ind. xxvii, 352.

Pappus.

Munsell.

Papyrus. See *Cyperus papyrus.*

Papyrus antiquorum. See *Cyperus papyrus.*

Para grass. Monkey grass.

Mierzinski.

Paratium tiliaceum. See *Hibiscus arboreus.*

Parkia roxburghii. Cupang.

Richmond, 1907.

Parkinsonia aculeata. Jerusaleum thorn.

Cross, Bevan, and King, page 55.

Dodge, C. R., 1897, page 259.

Mueller, L., 1867.

Piette.

Royle, 1855, page 391.

Watt, vol. VI, part I, page 110.

Passerina hirsuta.

DOURON, E., and VIDAL L. Attempts at making paper from *Passerina hirsuta* and other *thymelacea.* Annales musée colonial Marseille xxvi, 1-14 (1918); Bull. Agr. Intelligence x, 343; C. A. xiv, 2082.

Papaw. See *Anonaceae.*

Pat. See *Conchorus.*

PEARSON, R. S.

Recent industrial and economic development of Indian forest products. Paper Maker liii, No. 5, 417-421 (May 1, 1917); Paper Makers' Mo. J. lv, 144-145 (May 15, 1917).

Peas.

PEA and bean stalks for cellulose. Paper Makers' Mo. J. li, 344 (Aug. 15, 1913); Paper xi, No. 12, 25 (June 4, 1913).

REINKE, O. Cellulose from pea and bean stalks. Chem.-Ztg. xxxvii, 601; Paper xiii, No. 16, 20 (Dec. 31, 1913); C. A. vii, 3226; J. Soc. Chem. Ind. xxxii, 594.

Tolhausen, 1899.

Peat.

ANREP, A. Peat not suitable for paper. World's Paper Trade Rev. lx, No. 10, 476 (Sept. 5, 1913).

ARGUS, —. Peat in papermaking. Paper Mill xxxi, No. 11, 14 (March 14, 1908).

BERESFORD, G. D. Method and apparatus for the manufacture of half stuff for millboard and paper from peat moss. English Patent 23,478. Nov. 17, 1905. J. Soc. Chem. Ind. xxv, 864.

BERGH, R. S. S. Paper from peat. Monthly Consular and Trade Reports, 3005, 16 (Oct. 23, 1907).

BJORLING, —, and GISSING, —. Peat, its uses and manufacture. London. Review in Paper Trade J., Aug. 15, 1907; Paper Maker, June 1, 1907.

BLOTTINGS from peat. Paper Making xxviii, 119; Pulp Paper Mag. Can. vii, No. 1, 30 (Jan., 1909).

BRIN, A. Treating peat for the manufacture of paper pulp. English Patent 15,720. Sept. 1, 1892. J. Soc. Chem. Ind. xii, 858.

BROWN, W., and GREGG, HENRY. Treating peat to obtain fiber. English Patent 5,206. Nov. 2, 1883. J. Soc. Chem. Ind. iii, 424.

CALLENDER, W. M. Manufacture of paper and the like. English Patent 20,346. Nov. 12, 1900. J. Soc. Chem. Ind. xx, 831.

CALLENDER, W. M. Peat moss for papermaking. Pulp Paper Mag. Can. i, 155 (Sept, 1903).

CALLENDER, W. M. Peat moss or other fibers. Englisn Patent 15,632, 15,633. July 14, 1902; J. Soc. Chem. Ind. xxii, 817, 879.

CARDBOARD from peat. Paper Making xxvii, No. 10, 398-399 (Oct., 1908).

Davis, C. A. *See* Michigan.

Peat—Continued

DOULL, J. Peat moss and like materials. English Patent 9,408. Apr. 23, 1902. J. Soc. Chem. Ind. xxii, 708.

FABRE, L. Paper from peat. Rev. chim. ind. xxvii, 175 (1918); J. Am. Peat. Soc. xiii, No. 2, 268 (Apr., 1920); C. A. xiii, 1637.

FESZTY, A. Manufacture of paper from peat, etc. English Patent 15,601. June 30, 1897. J. Soc. Chem. Ind. xviii, 944.

FLEMING, RUFUS. Peat as a papermaking material. Sci. Am. xcii, 460 (June 10, 1905).

FRANZ, L. Manufacture of paper from peat. U. S. Patent 945,313. Jan. 4, 1910. C. A. iv, 668.

GEIGE, C. Manufacture of chemically prepared peat fiber. English Patent 881. Jan. 12, 1898. J. Soc. Chem. Ind. xviii, 597.

GISSING, F. T. The peat industry. London. Chas. Griffin & Co., Ltd. 1920. xxiv. 292 p.

GRANVILLE, BERNARD. Peat paper. World's Paper Trade Rev. lviii, No. 18, 868 (Nov. 1, 1912); Paper ix, No. 7, 28 (Oct. 30, 1912).

GUMBART, C. Preparing peat fiber and pulp. German Patent 303,834. J. Am. Peat Soc. xiii, No. 2, 270 (Apr., 1920).

HAZULUND, EMIL. Peat as a papermaking material. Paper xii, No. 2, 22-23 (June 25, 1913); Pulp Paper Mag. Can. xi, No. 8, 260-261 (Apr. 15, 1913).

HILDEBRANDT, C. F. Production of cellulose from moss or peat by heating with dilute acids. German Patent 314,712. Dec. 22, 1917. J. Soc. Chem. Ind. xxxix, 227A.

Hofmann, 1897, pages 1643-1644.

Hübner, 1903, page 7.

KALMANN, A. Pulp from peat. Paper Makers' Mo. J. xl, No. 7, 234-235 (July 15, 1902).

KERR, W. A. Peat and its products. Reviewed in Paper Trade Rev., Sept. 29, 1905; Pulp Paper Mag. Can. iv, No. 3, 73-74 (March, 1906); Paper Mill xxviii, No. 41, 34 (Oct. 14, 1905).

KIRNER, A. Half stuff from peat. English Patent 8,206. Apr. 17, 1905. J. Soc. Chem. Ind. xxv, 132,388.

KIRNER, A. Manufacture of peat half stuff. French Patent 353,538. Apr. 19, 1905. J. Soc. Chem. Ind. xxiv, 1028.

KRAUSE, M. Manufacture of paper and millboard from peat. French Patent 322,061. June 14, 1902. J. Soc. Chem. Ind. xxii, 315.

Lindsay, 1858.

Little, 1910.

LONDON, J. A. The utilization of fibrous peat for the manufacture of brown paper, wrappers and millboard. J. Soc. Chem. Ind. viii, 814.

Peat—Continued

MARX, ROBERT J. Peat in papermaking. World's Paper Trade Rev. lvii, No. 15, 734-735 (Apr. 12, 1912); Pulp Paper Mag. Can. x, No. 3, 78-79 (March, 1912).

MICHIGAN, GEOLOGICAL SURVEY. Report of the State Board of Geological Survey, 1906.

Peat, essay on its origin, uses and distribution in Michigan, by C. A. Davis. Paper pulp, paper and cardboard, page 307, etc.

MILLS, JAMES C. Paper made from peat. World Today xiv, 311-313 (March, 1908).

MILLS, JAMES C. Searchlight on some American industries. Chicago, A. C. McClurg & Co., 1911. "From peat and wood pulp to paper," pages 85-130.

NELSON, CHARLES E. Paper from peat. U. S. Patent 879,888. Feb. 25, 1908. Pulp Paper Mag. Can. vi, No. 5, 130 (May, 1908); Paper Makers' Mo. J. xlvi, No. 6, 205 (June 15, 1908).

NEW paper material. Paper Trade J. xxix, No. 19, 590 (Oct. 5, 1899).

OBTAINING cellulose for paper and cardboard from peat. Papierfabr. xviii, No. 36, 663-667; No. 37, 683-689 (Sept. 3, 10, 1920).

PAPER from peat. Sci. Am. xcvii, 413 (Dec. 7, 1907).

PAPER from peat. Pulp Paper Mag. Can. vi, No. 10, 251-252 (Oct., 1908); C. A. iii, 835.

PAPER from peat. Paper Mill, Nov. 23, 1912, page 12.

PAPER from peat fiber. Pulp Paper Mag. Can. ii, 33-35 (Feb., 1904).

PAPER from turf. Papierfabr. ix, No. 8, 231-232; No. 11, 326-327 (Feb. 24, Mar. 17, 1911).

PAPER pulp from peat. Timan's Rundschau iii, 497-499; J. Soc. Chem. Ind. xix, 166.

PAPER pulp from peat. Paper Maker li, 455 (May 1, 1916).

PEARSON, —, and STONEHAM, —. Turf and Irish moss paper. World's Paper Trade Rev. lii, No. 27, 144 (1909).

PEAT as a papermaker. Pulp Paper Mag. Can. x, No. 3, 72-73 (March, 1912).

PEAT as a papermaking material. Sci. Am. xcii, 460 (June 10, 1905).

PEAT as a papermaking stock. Paper Makers' Mo. J. xliv, No. 7, 230 (July 16, 1906); Paper Trade J. xlii, No. 23, 16 (June 7, 1906).

PEAT for paper. Pulp Paper Mag. Can. iii, No. 7, 211 (July 19, 1905).

Peat—Continued

PEAT for paper pulp. Papier-Ztg. xxiii, 1209; J. Soc. Chem. Ind. xviii, 485.

PEAT half stuff. U. S. Patent 836,069. Nov. 13, 1906. Paper Mill, Dec. 8, 1906.

PEAT in papermaking. Paper Making xxvii, No. 5, 192-193 (May, 1908).

PEAT in the manufacture of paper. Pulp Paper Mag. Can. xiii, No. 4, 107 (Feb. 15, 1915); Paper Makers' Mo. J. liii, 76-77 (March 15, 1915); Paper Maker 1, No. 4, 406 (Oct., 1915); Intern. No., 1914-1915, page 44.

PEAT paper. Pulp Paper Mag. Can. ii, 255-256 (Sept., 1904).

PEAT paper. Paper Making xxvii, No. 10, 396 (Oct., 1908).

PEAT paper. World's Paper Trade Rev., Nov. 1, 1912, page 868; Paper Mill, Sept. 28, 1912, page 35.

PEAT paper and board. Paper Mill xxxii, No. 22, 6 (1909).

POLLAK, A., and ESSES, C. Treatment of peat turf for use in the manufacture of paper. English Patent 9,589. May 8, 1901. J. Soc. Chem. Ind. xx, 830.

REECE, THOMAS. Reducing raw peat to pulp for papermaking. Paper xxvi, No. 26, 12 (Sept. 1, 1920).

REMINGTON, J. S., BOWACK, D., and DIXON, B. Peat as a papermaking material. World's Paper Trade Rev. li, No. 10, 377-378 (1909); Pulp Paper Mag. Can. vii, No. 5, 169-170 (May, 1909); Papierfabr. vii, 422-423 (1909); Paper Mill xxxii, No. 12, 32 (1909); C. A. iii, 1458.

SEARCH for fibers. World's Paper Trade Rev.; Pulp Paper Mag. Can. xvi, No. 21, 464 (May 23, 1918).

TRIAL of peat proves unsuccessful. Paper Trade J., Nov. 8, 1906.

UTILIZATION of peat. Bull. Imp. Inst. iii, 166-176 (1905).

UTILIZATION of peat mosses. Pulp Paper Mag. Can. viii, No. 8, 193-194 (Aug., 1910); Paper Making xxix, No. 9, 354-356 (Sept., 1910).

ZSCHORNER, KARL A. Manufacture of fibrous materials suitable for paper from peat. English Patent 15,797. July 4, 1897. J. Soc. Chem. Ind. xviii, 597.

ZSCHORNER, KARL A., & CO. Torfindustrie. Karl A. Zschorner und Co. Torfpapier. Torf Packpapier. Torf Papendeckel. Wien. Zschorner und Co. 1899. 222 p.

Pederia foetida. Bodolee sutta.

Davis.

Hannan, page 129.

Spon.

Peepul tree. See *Ficus religiosa.*

Pennisetum alopecuros. Moya grass.

Dodge, C. R., 1897, page 260.

Indian Forester xl, 291 (1914); Bull. Imp. Inst. xii, No. 4, 627-628 (Oct., 1914).

Juritz, page 75.

Phillips, S. C., 1915, page 145.

Pennisetum benthani. Elephant grass.

ANOTHER papermaking material. Bull. Imp. Inst. xi, 68-70 (1913); Paper xi, No. 12, 25 (June 4, 1913); J. Soc. Chem. Ind. xxxii, 482.

Juritz, page 74.

ZANDERS, H. Grasses from German West Africa. World's Paper Trade Rev. lvii, No. 18, 940 (May 3, 1912); Papierfabr. x, 479-480 (1912).

Pennisetum macrourun. Olei grass.

Juritz, page 75.

Pennisetum purpureum. Elephant grass.

Phillips, S. C., 1915, page 263.

PEPETERA ESPANOLA.

Paper. English Patent 123,093. Feb. 6, 1919. C. A. xiii, 1531.

Peptúrus albidus. Mamaki bast.

Hannan, page 134.

Phalaris canariensis. Canary grass.

Davis.

Lindsay, 1858.

Phaseolus. Bean.

MIRUS, —. New paper materials. Wochbl. Papierfabr. xliv, No. 39, 3700; Papier-Ztg. xxxviii, No. 78, 2875; Papier fabr. xi, No. 39, 1168.

PEA and bean stalks for cellulose. Paper Makers' Mo. g. li, 344 (Aug. 15, 1913).

REINKE, O. Cellulose from pea and bean stalks. Chem. — Ztg. xxxvii, 601 (1913); Paper xiii, No. 16, 20 (Dec. 31, 1913); Papier-Ztg. xxxviii, No. 10, 326 (1913); J. Soc. Chem. Ind. xxxii, 594; C. A. vii, 3226.

Schaeffer, 1772.

Tolhausen, 1899.

PHILLIPS, S. CHARLES.

The empires' resources in papermaking materials. Paper Maker xlix, No. 6, 627, 629, 631, 634 (June, 1915); 1, No. 1 25-35; No. 2, 143-149; No. 3, 257-265 (July-Sept., 1915); Intern. No., 1914-1915, 45-75; J. Roy. Soc. Arts lxiii, 613-632 (1915); Paper xvi, No. 12, 13-14 (June 2, 1915); J. Soc. Chem. Ind. xxxiv, 655.

Phleum prateuse. Timothy. See *Hay.*

Phoenix dactylifera. Date palm.

Dodge, C. R., 1897, page 260.

Spon, vol. I, page 986.

Phoenix farinifira. Date palm.

Liotard.

Phoenix sylvestris. Wild date palm. Date sugar palm.

Liotard, page 19.

Watt, vol. VI, part I, page 208.

Phorium tenax. New Zealand flax.

BADOIL, C. Paper pulp from new fiber without alkali. French Patent 382,439. Oct. 1, 1907. J. Soc. Chem. Ind. xxvii, 244.

Cross and Bevan, page 112.

Dodge, C. R., 1897, page 261.

Dodge, C. R., 1910.

FORNSTEDT, GUSTAF. Phorium fiber as paper material. Paper v, No. 12, 11-12 (Dec. 6, 1911).

Griffin and Little, page 127.

Kirchner, vol. II, page 75.

Montessus de Ballore, page 254.

MURRAY, JOHN. An account of the *Phorium tenax* or New Zealand flax. Printed on paper made from its leaves with a postscript on paper. Edinburgh, 1836.

Phillips, S. C., 1915, page 259.

Spon, vol. 1, page 986.

Valenta, 1904.

WASTE pulp from New Zealand flax. Bull. Imp. Inst. xvi, 134-138 (1918); Paper Makers' Mo. J. lvi, 363-364 (Dec. 16, 1918); Paper xxv, 534.

WINKLER, O. New Zealand flax as raw material for paper. Papier-Ztg. xxvii, 2555 (1902); J. Soc. Chem. Ind. xxi, 1192.

Phoscum. Earth moss.

Piette.

Schaeffer, 1772.

Phragmites communis. Common reed. Reed grass

Dodge, C. R., 1897, page 265.

FESTZY, A. von. Paper pulp from the root refuse of the common reed. English Patent 7,438. Apr. 8, 1899. J. Soc. Chem. Ind. xviii, 942.

Hannan, page 125.

HAYLES, A. W. Manufacture of paper from vegetable fibers. English Patent 15,697. Oct. 4, 1890. J. Soc. Chem. Ind. x, 944.

HERIG, — . The utilization of the common reed (*Phragmites communis Trin.*) for the manufacture of pulp. Cellulosechemie i, No. 7, 65-76 (Nov. 12, 1920).

Phragmites communis—Continued

JOHNSON, H. A. Utilization of reeds for papermaking. Commerce Reports, March 13, 1918, page 947.

Kirchner, vol. II, page 56.

KLEIN, ARTHUR. Delta grass pulp. Paper Maker, Sept. 1, 1911.

KNÖSEL, TH. Reed straw as paper material. Papier-Ztg. xli, No. 80, 1546 (1916); See also No. 77, 1479 (1916).

ORDODY, B. von, and SCHOTTIK, B., and Co. Working reed stalks into long fibers and fiber for paper stock. German Patent 285,539. June 14, 1914. C. A. x, 1269.

RUSSELL, R. W., and HOWLAND, T. Making paper pulp from reed. U. S. Patent 70,474. Nov. 5, 1867.

Schaeffer, 1772.

SCHULTE, H. Reed as a raw material for paper. Zentr. oesterr-ungar Papierind. xxxvi, No. 7, 130-132 (1918).

Phragmites karka. Savannah grass. Kaing grass.

Annual report of the Board of Scientific Advisers of India, 1916-1917; Bull. Imp. Inst. xvi, No. 4, 577.

Hanausek, 1911.

Raitt, 1913.

Phragmites vulgaris. Reed.

Ellis, H. E., 1917.

LOWE, H. Making paper pulp from reeds. U. S. Patent 20,355. May 25, 1858; 20,884. July 13, 1858; 23,099. March 1, 1859.

Phrynium dichotomum.

Watt, vol. VI, part I, page 216.

Phulahi. See *Acacia modesta.*

Phytolacca decandra. Poke weed.

Piassava. See *Attalia funifera.*

PIETTE, L.

Die Fabrikation des Papiers aus Stroh und viehlen anderen Substanzen. 2te, Aufl. Cöln, 1861.

336 p. 160 specimens. 8°.

Manufacture of paper from straw and many other materials.

Pimelea axifolia. Currijong.

Guilfoyle.

Pine bark.

Pine and poplar barks in papermaking. Paper Maker lv, 2 (Jan. 1, 1918).

See also Bark.

Pine cones.

Davis.

Schaeffer, 1772.

Pine leaves.

Charpentier.

Pine needles.
ARIES, R. Pulp from pine needles. French Patent 493,551. Papeterie xli, 403 (Oct. 10, 1919); Paper xxv, 658.

Pineapple. See *Annas sativa.*
See *Bromelia.*

Pinguin. See *Bromelia pinguin.*

Pipturus propinquus. Queensland grass cloth plant.
Mueller, L., 1877.

Pisang. See *Musa textilis.*

Pisum arvense.
Mueller, L., 877.

Pisum sativum.
Mueller, L., 877.

Pita. See *Agave americana.*

Pittesporum cornifolium. Currijong.
Davis.

Pittesporum crassifolium. Thick leaved pittesporum.
Davis.

Plagianthus betulinus. Ribbon tree of New Zealand.
Dodge, C. R., 1897, page 271.

Plagianthus sioides. Currijong. Corragine.
Dodge, C. R., 1897, page 272.
Spon, vol. I, page 994.

Plantain. See *Musa paradisiaca.*

PLANTS available for papermaking.
Paper xvi, No. 8, 17-18 (May 5, 1915); Paper Maker xlix, No. 6, 662 (June 1, 1915).

PLANTS used in papermaking.
Paper Making xxvii, No. 2, 76-77 (Feb., 1908).

Plume grass. See *Arundo conspicua.*

Poa caerulea.
Piette.

Poa caespitosa. Wire grass. Australian meadow grass. Tussock.
Dodge, C. R., 1897, page 272.
Guilfoyle.
Phillips, S. C., 1915, page 257.
Spon, vol. I, page 994.

Poa cynosuroides.
Dodge, C. R., 1897, page 272.
Spon, vol. I, page 994.

Poa pratensis. Blue grass. June grass. Spear grass. Kentucky blue grass.
Dodge, C. R., 1897, page 272.
Munsell.

Poke weed. See *Phytolacca decandra.*

Poker plant. See *Tritona uvaria.*

Pollinia eriopoda. Bhabar grass.

Cross, Bevan, and King, page 55.

Ponzolzia hypoleuca.

von POSSANNER, —. Fibers from the German colonies for manufacture of paper. Papierfabr. x, 60-61 (1912); Paper viii, No. 13, 27 (Sept. 11, 1912); Paper x, No. 11, 35 (Feb. 26, 1913); C. A. vi, 2527.

Poplar bark.

PINE and poplar bark for papermaking. Paper Maker lv, 2 (July 1, 1918).

Poplar down.

Schaeffer, 1772.

Wehrs.

Poppy. See *Papaveraceae.*

Porcupine grass. See *Stipa spartea.*

Porphyie. See *Triodia irritans.*

SEARCH for new paper pulps. Papeterie xli, 311-315 (Sept. 10, 1919); Paper xxv, 833 (Dec. 31, 1919).

Posidonia australis. Marine fiber.

BEADLE, C., and STEVENS, H. P. A much praised marine peat. Paper Maker xl, 237-238 (1910).

Earl, J. C., 1916.

GREEN, ARTHUR G., and FRANK, G. H. Marine fiber. Paper Making xxx, No. 9, 334, 336 (Sept., 1911).

Hargreaves, 1916.

JERVELL, JOHN G. New Australian fiber. Papeterie xxxi, 627-628 (1909).

Lightfoot, Bull. No. 11, page 36.

Phillips, S. C., 1915, page 259.

POSIDONIA fiber. Science Industry i, No. 6, 371-375 (Oct., 1919).

POSIDONIA for papermaking. Paper Making xxxvi, No. 8, 253-254.

READ, JOHN, and SMITH, H. G. Marine fiber or *Posidonia australia.* Institute Science and Industry, Commonwealth of Australia. Bull. No. 14, 1919. 60 p. 20 pl. See C. A. xiv, 352.

WINTERBOTTOM, D. C. Reports on the supplies and costs of raising marine fiber from the deposits off the coast of South Australia. South Australia, Department of Chemistry, Bull. No. 1, 49-52 (1916); J. Soc. Chem. Ind. xxxvi, 542-543 (1917); Z. angew. Chem. xxxi, 67 (1918).

Potari. See *Abutilon indicus.*

Potatoes.

HERZBERG, W. Residue of potato starch works as a material for papermaking. Mitt. kgl. mech.-tech. Versuchs., 1892, 124-126; J. Soc. Chem. Ind. xi, 934.

Hofmann, 1897, pages 1644-1645.

Lindsay, 1858.

POTATO stalks for board making. Papierfabr. viii, 49-52 (1909); Paper Mill, Mar. 19, 1910.

Schaeffer, 1772.

Tolhausen, 1899.

Pouretia planktankifolia.

Davis.

Pousolsia. See *Memorialis pentandra.*

Prairie grass. See *Sporabalus cryptandrus.*

Prickly pear. See *Opuntia dilenii.*

Prionium palmita. Palmet. Palmiet.

Dodge, C. R., 1897, page 275.

Juritz, page 36.

PAPER pulp from Cape fibers. Agri. J. Cape Good Hope xxxii, 208 (Feb., 1908); Board Trade J., Mar. 26, 1908; Paper Makers' Mo. J. xlvi, No. 4, 131 (Apr. 15, 1908); Paper Maker xxvii, No. 5, 195 (May, 1908); J. Soc. Chem. Ind. xxvii, 352.

Spon, vol. 1, page 994.

Pruns aspera.

Setlik, 1907.

Psamma aremaria. See *Ammophila arenaria.*

Pteris. Fern brake.

CROUZEL, E. Prevention of the shortage of paper. Répert. pharm. xxviii, 292 (1917); Pulp Paper Mag. Can. xvi, 257; C. A. xii, 223.

McElhenie, 1910.

Pterospermum acerifolium. Urania.

Lindsay, 1858.

Pua hemp. See *Mautia puya.*

PULPWOODS in Canada's prairie provinces.

Canada, Dept. of Interior, Forestry Branch, Bull. No. 50. Paper Maker 1, 183-186 (Aug. 2, 1915).

Punga bark. See *Cephaloncma polyandrum.*

Puyba. See *Boehmeria.*

Q

Quarce. See *Daphne involucrata.*

Queensland bottle tree. See *Sterculia rupestris.*

Queensland grass cloth tree. See *Pipturus propinquus.*

Queensland hemp. See *Sida rhombifolia.*

Quercus suber. Cork tree.

Davis.

Quickens. See *Triticum repens.*
Quitch. See *Triticum repens.*

R

Raffia. See *Raphia ruffia.*
Ragi millet. See *Eleusine coracana.*
Ragweed.
Lindsay, 1858.
Rai bhenda. See *Abelmoschus tetraphyllus.*
RAINES, RALEIGH.
Japanese paper plants. Pulp Paper Mag. Can. xi, No. 2, 57-59 (Jan. 15, 1913); Paper Maker xlv, No. 3, 419-420 (1913); Paper Mill xxxvi, No. 8, 116-120 (1913); Paper x, No. 9, 20-21 (Feb. 12, 1913); C. A. vii, 1971.
RAINES, RALEIGH.
Paper plant investigation by the U. S. Department of Agriculture. Pulp Paper Mag. Can. xi, No. 1, 27-28 (Jan., 1913); Paper Makers' Mo. J. li, 305-306.
RAITT, WILLIAM.
Bamboo as a material for paper pulp.
RAITT, WILLIAM.
Fiber prospecting. World's Paper Trade Rev. li, 569; C. A. iii, 1458.
RAITT, WILLIAM.
Fiber prospecting. The result. Paper Trade J., Apr. 15, 1919.
RAITT, WILLIAM.
Indian grasses as raw material for paper. Indian Engineer liv, No. 22, 297-298; Rev. papeterie xli, No. 5, 81-84.
RAITT, WILLIAM.
New fibers for paper. I, II, III, IV. Tropical Agriculturist xxxii, xxxiii (May-Aug., 1909).
RAITT, WILLIAM.
Paper and pulp at the exhibition of Allahabad. Papierfabr. ix, Festschrift, 90-93 (1911).
RAITT, WILLIAM.
The Savannah grasses of Northern and Central India. An investigation of their possibilities for papermaking purposes. Indian Forest Records v, part III (1913); Papierfabr. xii, 90-94, 124-128, 156-161 (1914); Paper Maker xlvii, No. 2, 216-219 (Feb. 2, 1914); Bull. Imp. Inst. xii, No. 1, 135-136 (Jan.-Mar., 1914).
Rajmahal creeper. See *Marsdenia tenacisima.*
Ram turai of India.
Watt.
Ramie. See *Boehmeria nivea.*
Rape. See *Brassica campestria.*

Raphia ruffia. Raffia palm.

Dodge, C. R., 1897, page 276.

HUNT, W. H. Raffia fiber is used for cigarette paper. Paper Mill, Aug. 16, 1902, page 32.

Raphia vinifera. Bamboo palm.

Bull. Misc. Inform., Kew, 1895, pages 88-92; Selected Papers, vol. I, page 232.

Dodge, C. R., 1897, page 277.

Raspberry. See *Rubus.*

Rattan. See *Calamus verus.*

Ravenala madagascariensis. Giant wild plantain.

Davis.

RAW material for pulp and paper.

Pulp Paper Mag. Can. iv, No. 11, 281-283 (Nov., 1906).

Red alder. See *Alnus oregona.*

Red silk cotton. See *Bombax malabaricum.*

Reed. See *Arundo donax.*
Phragmites communis.
Phragmites vulgaris.

Reed grass. See *Glyceria aquatica.*

Reed mace. See *Typha elephantia.*

Rhea. See *Boehmeria nivea.*

Rhubarb.

Archer.

Ribbon tree. See *Plagianthus betulinus.*

Rice. See *Orysa sativa.*

Rice husks.

UTILIZATION of rice and its by-products. Bull. Imp. Inst. xvi, No. 1, 23 (1918).

Rice, wild. See *Zizania aquatica.*

Rice paper plant. See *Aeschyomene paludosa.*

Rice root grass. See *Epicampes macroura.*

RICHMOND, GEORGE F.

Philippine fibers and fibrous substances—their suitability for papermaking. Philippine J. Sci. i, 433-462; 1075-1081 (1906); ii, 81-112 (1907); v A, 233-255 (1910); C. A. i, 1621, 1622; ii, 1185; v, 1513; J. Soc. Chem. Ind. xxv, 863; xxvi, 274, 940; xxix, 1450.

Ricinodendron rautanenii, Mungongo.

INVESTIGATION of materials suggested for the manufacture of paper. Bull. Imp. Inst. xvii, No. 2, 150-152 (1919).

Ricinus arboreus giganteus.

CELLULOSE from *Ricinus arboreus giganteus* (Hortus Wulle). Memoranda of Heinrich Wulle in Naples. Papier-Ztg., 1909, No. 13, 470; Paper Making xxviii, 279 (1909)

ROESSLER, L. von. New plant fiber. Papierfabr., Festschrift, 1910, 42-46.

Ricinus communis. Castor oil plant.

Dodge, C. R., 1897, page 280.

LOOMIS, BURDET. Possibilities of the castor oil plant. Paper xxii, No. 19, 527 (July 17, 1918); Pulp Paper Mag. Can. xvi, 959.

PAPER from the castor oil plant. Paper Making xxviii, No. 7, 279 (July, 1909).

Watt, vol. VI, part I, page 508.

River rush. See *Isolepus nodosa.*

River weeds.

PAPER from river reeds. Paper xxii, No. 4, 65 (Apr. 3, 1918).

Rockweed. See *Fucus vesiculosus.*

Roots.

Lindsay.

Rosaceae. Roses. Brambles.

Lindsay.

Rose mallow. See *Hibiscus moscheutos.*

Rosella fiber.

ROSELLA fiber in papermaking. Agr. News xviii, 201 (1919).

ROSTAING, LEON, ROSTAING, MARCEL, and DU SERT, FLEURY PERCIE.

Précis historique, descriptif, analytique et photomicrographique des vegetaux propes à la fabrication de la cellulose et du papier. Paris, H. Everling (pref., 1899).

ix, 84p. 11. 50 pl. (1 col) 28.5 cm.

Historical, descriptive, analytical, and photomicrographic compendium of plants adapted to the manufacture of cellulose and paper.

Roussa grass. See *Andropogon martini.*

ROYAL GARDENS, KEW.

Bulletin of Miscellaneous Information. Addition Series, II. London, 1898. 280 pp.

ROYAL GARDENS, KEW.

Selected papers from the Kew Bulletin. I. Vegetable fibers.

ROYLE, JOHN FORBES.

The fibrous plants of India fitted for cordage, clothing, and paper. With an account of the cultivation and preparation of flax, hemp, and their substitutes. London, Smith, Elder & Co., 1855.

1 p. 1 (v)-xiv, 403 (1) p. illus. 22.5 cm.

Rozelle hemp. See *Hibiscus sabdariffa.*

Rubiaceae. Madder.

Davis.

Rubus. Bramble. Berry bush.
Davis.
Lindsay.
McElhenie, 1910.

RUBY, A.
New raw materials. Proposed technological index file for papermaking materials. Papier; Paper xxiii, No. 18, 479-481 (Jan. 8, 1919).

Rushes.
McElhenie, 1910.
Munzell.
See also *Ecdericola monostachya.*

Rutaceae. Rue family.
Davis.

Rye. See *Secale cereale.*

Rye grass. See *Hordeum murinum.*
See *Lolium perenne.*

S

Sabai. See *Ischaemum angustifolium.*

Sabal palmetto. Cabbage palmetto of Florida.
Dodge, C. R., 1897, page 281.
Spon, vol. I, page 994.

Saccharum arundinaceum.
Raitt, 1913.

Saccharum fuscum. See *Savannah grass.*

Saccharum mara.
Valenta.

Saccharum munja. *Saccharum sara.* Munj grass. Munja. Sara grass.
Cross, Bevan and King, page 56.
Dodge, C. R., 1897, page 65.
Liotard, page 65.
Raitt, 1909.
Raitt, 1913.
Richmond, C. F., 1906.
Spon, vol. I, page 994.
Valenta, 1904.
Watt, vol. I, page 109.

Saccharum narenga. Savannah grass.
Raitt, 1913.

Saccharum officinarum. Sugar cane.
Höhnel, page 116.
OKAZAKI, U. Paper pulp from sugar cane leaves. U. S. Patent 1,278,199. Sept. 10, 1918. C. A. xii, 2,440; Paper xxiv, 117.
See also *Bagasse.*

Saccharum spontaneum. Talahib grass. Savannah grass.
Annual Report of the Board of Scientific Advisers for India, 1916-1917; Bull. Imp. Inst. xvi, No. 4, 577 (1918).
Boomer, 1919.
Brown and Fischer, Bull. No. 16.
Liotard, pages 19, 65.
Raitt, 1913.
Richmond, 1906.

Sacking tree. See *Antiaris saccidora.*

Sage. See *Salvia.*

Sagittaria sagittifolia. Arrowhead.
Hannan, page 127.

Sago palm. See *Arenga saccharifera.*
See *Colocasia antiquorum.*
See *Livistonia mauritiana.*
See Metroxylon sagu.

SAHLIN, E. G.
Textile fiber plants of the Philippines and their suitability as raw material for cellulose. Svensk. Pappers-Tidning, 1910, 3, 23, 27.

Sal bark. See *Shorea ribusta.*

Salix alba. Osier. Willow.
Davis.
Mueller.

Salt bush. See *Atriplex halimus.*

Salt Grass. See *Spartina juncea.*

Salvia cannariensis. Sage.
Davis.
IMHAUS, E. Paper pulp from sage. French Patent 355,245. June 15, 1905. J. Soc. Chem. Ind. xxiv, 1185.

Sambucus canadensis. Elder.
Davis.

Sand grass.
SANDERSON, L. Manufacture of brown paper from sand grass. U. S. Patent 614. Feb. 22, 1838.

Sandoricum vadalianum. Santol.
Richmond, 1907.

Sansevieria cylindrica. Ife hemp.
Davis.
Dodge, C. R., 1897, page 287.

Sansevieria guineensis. African bowstring hemp. Moorva.
Dodge, C. R., 1897, page 287.
Mierzinski, page 19.
Richmond, 1906.

Sansevieria latifolia.
Davis.

Sansevieria thyrsiflora.
Leighton, 1918.

Sansevieria roxburghiana. Moorva.
Dodge, C. R., 1897, page 289.

Sansevieria zeylanica. Ceylon neyanda. Bowstring hemp.
Boomer, 1919.
Dodge, C. R., 1897, page 290.
Dodge, J. R., Annual Report, Dept. of Agr., 1879.
Juritz, page 74.
Liotard, page 6.
Spon, vol. I, page 995.
Watt, vol. VI, part I, page 109.

Santol. See *Sandoricum vidalianum.*

Sara grass. See *Saccharum munja.*

Sarcochlyamys pulcherrima. Nettle.
van den Corput.

Savannah grasses.

BAMBOO and Savannah grasses as papermaking materials. Paper Maker lvii, No. 3, 288 (Mar. 1, 1919); Paper xxiv, No. 8, 264 (Apr. 30, 1919).

Phillips, S. C., 1915, pages 143-149.

PULP for the whole world in India. Paper xxiv, No. 13, 489,506 (June 4, 1919).

RAITT, WM. Cellulose in India. Paper Trade J. lviii, No. 1, 46-52; C. A. viii, 1203.

RAITT, WM. The Savannah grasses of Northern and Central India. An investigation of their possibilities for papermaking purposes. Indian Forest Records v, part III, 1-44 (Sept., 1913); Paper xiii, No. 19, 15-16, 34; No. 20, 17-20; No. 21, 20-21; No. 22, 20-21 (Jan. 21-Feb. 11, 1914); Paper Maker xlvii, No. 1, 71-79 (Jan. 1, 1914); World's Paper Trade Rev. lxi, No. 3, 112-113; No. 4, 162-166; No. 5, 211-213 (Jan. 9-30, 1914); Papierfabr. xii, No. 5, 124-129 (1914); C. A. viii, 1204-1205.

See also the following (the arrangement is Raitt's, in order of importance as papermaking materials):

Saccharum spontaneum.
Saccharum arundinaceum.
Saccharum munja.
Saccharum narenga.
Anthistiria gigantea (arundinacea).
Anthistiria gigantea (villosa).
Imperata arundinacea.
Eragrostis cynosuroides.
Arundo donax.
Phragmites karka.

Saccharum fuscum.
Andropogon intermedius.
Andropogon squarrosus.

Savannah grasses—Continued

Andropogon nardus.

Andropogon contortus.

Trianthus ravennae.

Aristida cyanantha.

Triraphis madagascariensis.

Sawdust.[1]

MANUFACTURING paper pulp from sawdust. Paper xxiv, 1137 (1919).

MARX, R. J. Sawdust as raw material for paper. Tidskrift papirindustri, July 15, 1918.

NEW way of making paper from sawdust. Current Opinion lxv, 201-202 (Sept., 1918).

OBSERVATIONS on sawdust pulp. Paper xxii, 645 (Aug. 14, 1918).

PAPER from sawdust. Account of the work of the Saw Dust Pulp and Paper Co. Eng. News xii, 305 (1884).

SAWDUST. Paper Mill xli, No. 27, 7 (1918); Paper xxiii, 35.

SAWDUST for papermaking. Paper Maker lvi, No. 5, 453 (Nov. 1, 1918); Paper Makers' Mo. J. lvi 133, 167 (May 15, June 15, 1918).

SAWDUST paper. Paper xxiv, 148 (1919).

SPARRE, P. A. Paper from sawdust. English Patent 29,-118. Dec. 31, 1909. C. A. v, 2947.

STRACHAN, JAMES. Sawdust as a material for papermaking. World's Paper Trade Rev., July 12, 1918; Paper xxii, 609-610 (Aug. 7, 1918).

USE of sawdust in papermaking. J. Soc. Chem. Ind. xxxvii, 189-190 R; Paper xxiii, 360; Paper Makers' Mo. J. lvi, 204 (July 15, 1918).

WOOD pulp from sawdust. World's Paper Trade Rev.; Paper xxiii, 256 (Nov. 13, 1918).

Saw grass. See *Cladium effusum.*

Saw palmetto. See *Serenoa serrulata.*

SCHAEFFER, JACOB CHRISTIAN.

Jacob Christian Schaeffers sämtliche Papierversuche. 2 Aufl. nebst ein und achtzig Mustern und dreizehn Theils illuminierten Theils schwarzen Kupfertafeln. Regensburg, Gedruckt mit zunkelischen Schriften, 1772.

6 v. in 1. 14 pl. (2 fold., 8 col.) samples. 19.5 cm.

Jacob Christian Schaeffer's—collected researches on paper. 2nd. ed. With 81 samples and 13 copper plates, part black, part colored.

The samples are specimens of paper and a few textile fabrics, made from different materials. The following are the different specimens of paper to be found in the six volumes:

[1]With a few exceptions only the more recent articles on sawdust are given.

SCHAEFFER, J. C.—Continued

Vol. I. Jan. 15, 1765. Paper made from poplar down, wasps' nests, sawdust, pine-chips, beech wood, willow wood, willow wood without rags, tree moss, poplar, hop tendrils, hop wood, grapevine outer bark, grapevine inner bark and wood.

Vol. II. Mar. 30, 1765. Paper made from hemp, mulberry, mulberry inner bark, aloe leaves, clematis wood, stinging nettle, willow, bull rush, earth moss, barley, leaves of trees—wintered, cabbage stalks, roof paper made from tow.

Vol. III. Nov. 3, 1765. Paper made from Cyprian asbestos, seed down, thistle stalks, burdock stalks, leaves of the lily of the valley, seed down of the thistle, water moss, Bavarian turf, Hanoverian turf, poplar down thread—knit—woven in colors, plain and printed.

Vol. IV. Jan. 1, 1766. Paper made from silk plant, mallow, orache, spruce fir wood, Artemisia wood, Indian corn, young grapevines, lace from aloe fiber.

Vol. V. Apr. 13, 1767. Paper from genista, pine cones, potatoes—both skins and insides, shingles.

Vol. VI. 1771. Paper from reed, bean leaves, horse-chestnut leaves, tulip leaves, linden leaves, walnut leaves, genista, yellow wood, Brazil wood.

For a description of this book, see Hunter, Paper xxvii, No. 2, 16-18 (Sept. 15, 1920).

Schizostachyum lumampao. Bamboo.

Brown and Fischer, Bull. No. 16, page 15.

Schoenus sphoerocephalus. Bottom bog rush.

Lightfoot.

SCHWALBE, CARL G.

Agriculture and forestry as producers of raw materials for papermaking. Papier-Ztg. xxxix, No. 10, 303-304; No. 11, 343-344 (1914); C. A. viii, 1345.

Scilla rigidifolia. Leaves.

Juritz, page 84.

PAPERMAKING materials. Bull. Imp. Inst. xii, 42-45 (1914); Paper xiv, No. 13, 21 (June 10, 1914); J. Soc. Chem. Ind. xxxiii, 477.

Scirpus fluviatilis. Club rush.

Lightfoot, Bull. No. 11.

Lindsay, 1858.

Phillips, 1915, page 259.

Scirpus lacustris. Bulrush. Mat rush. Marsh gladden. Tule grass.

Dodge, C. R., 1897, page 291.

Mueller, 1867, page 31.

Schaeffer, 1772.

Spon, vol. I, page 996.

Strother, 1883.

Scirpus lacustris occidentalis. Tule grass.
Mierzinski, page 12.

Scirpus litteralis. Rush.
NORTON, J. S., and WIRTZ, Q. Papyrus for papermaking. World's Paper Trade Rev. xlvii, 737-742 (May, 1907); C. A. ii, 180.

Scirpus maritimus. Salt marsh club rush.
Mueller, 1867, page 31.

Scirpus palustris. Marsh rush.
Davis.

SCOTT, JAMES.
Some notable fibers. Their striking contrasts. Paper Maker xlviii, No. 5, 677-678 (Nov., 1914); Paper xvi, No. 9, 14-15 (May 12, 1915).

Screw pine. See *Pandanus odoratissimus.*

Scriptural reed. See *Arundo donax.*

Sea coast rush. See *Diannella longifolia.*
See *Juncus maritimus.*

Sea grass. See *Zosteris marina.*

Sea Island cotton. See *Gossypium barbadeuse.*

Sea lyme rush. See *Elymus arenarius.*

Sea mallow. See *Lavatera maritima.*

Sea matweed. See *Ammophilis arenaria.*

Sea reed. See *Ammophilia arenaria.*

Sea rush. See *Juncus maritimus.*

Sea tang. See *Zostera marina.*

Sea weed. See *Algae marina.*

Sea wrack. See *Fucus vesiculosus.*

SEARCH for new papermaking fibers.
Paper Making xlvii, 41 (Jan., 1914); xlix, 54-55 (Jan., 1915); lii, Annual No., 1915-1916, 45-46.

Sebesten. See *Cordia myxa.*

Secale cereale. Rye.
See *Straw.*

Secrate.
Davis.

Sedge grass. See *Carex appressa.*

Sedge reeds.
Norton, 1910.

Seed down.
Schaeffer, 1772.

Seronoa serrulata. Saw palmetto.
Dodge, C. R., 1897, page 293.
Dodge, 1910.
MELL, C. D. The saw palmetto, a neglected fiber in the South. Paper Trade J. xlii, No. 7, 181-182; C. A. x, 1433.

Sesbania aculeata. Dunchee. Danchi. Dhonchi.
Dodge, C. R., 1897, page 294.
Mierzinski, page 20.
Royle, 1855, page 391.

Sesbania cannabina.
Mueller, L., 1877.

Setburosa. See *Daphne cannabina.*

SETLIK, B.
Japanese leather and oil papers. Paper iv, No. 6, 11-12 (July 26, 1911).

SETLIK, B.
Japanese papers. Papier-Ztg. xxxii, 2854-2855, 3198-3200, 3738-3739, 4018-4020 (Aug.,-Nov., 1907); C. A. ii, 587.

Shaenus sphaerocephalus. Bottom bog rush.
Lightfoot, Bull. No. 11.

Sheathed galingale. See *Cyperus vaginatus.*

Sheathed rush. See *Juncus.*

Shining rush. See *Cyperus lucidus.*

Shoe flower. See *Hibiscus rosa-sinensis.*

Shorea robusta. Sal bark.
CROSS, C. F., and BEVAN, E. J. Sal bark (*Shorea robusta*) and some physiological problems. J. Soc. Dyers Colourists xxxv, 68-70 (1919); C. A. xiii, 2277.

Short staple cotton. See *Gossypium herbacium.*

Sida. See *Sida rhombifolia.*

Sida retusa. Queensland hemp.
Lightfoot, Bull. No. 11, page 33.
Mierzinski, page 14.
Wild plants, 1914.

Sida puchella. Victorian hemp.
Davis.

Sida rhombifolia. Queensland hemp. Sida. Tea plant.
Dodge, C. R., 1897, page 296.
FIBERS from different sources. Bull. Imp. Inst. xv, 7-23 (1917).
Mierzinski.
Piette.
Spon, vol. I, page 996.

Sida rhomboida. Barriala.
Guilfoyle.

Sida tiliaefolia.
Davis.

Silk.
Piette.

Silk cocoon refuse.
Munsell.

Silk grass. See *Karatas plumieri.*

Silk plant. See *Asclepias syriaca.*

Silk weed of the United States. See *Asclepias syriaca.*

SINDALL, ROBERT W.

Indian papermaking fibers. Paper Makers' Mo. J. xliii, No. 11, 394-395; No. 12, 431-432 (Nov. 15, Dec. 15, 1905); xliv, No. 2, 46-47; No. 3, 91-92; No. 4, 122-123 (Feb.-Apr., 1906).

SINDALL, ROBERT W.

The manufacture of paper, with illustrations and a bibliography of works relating to cellulose and papermaking. London, A. Constable and Co., Ltd., 1908.

x, 275 p. incl. illus., tables. 21.5 cm. (Half title: The "Westminster" Series.)

SINDALL, ROBERT W.

Paper technology, an elementary manual on the manufacture, physical qualities and chemical constituents of paper and of papermaking fibers. 2d. ed., rev. London, C. Griffin and Co., Ltd. 1910.

xv, 269 p. front. illus., xiii pl. 23 cm.

SINDALL, ROBERT W.

Raw papermaking material problem. World's Paper Trade Rev., Mar. 1, 1918; Paper xxii, 321-322 (May 29, 1918).

SINDALL, ROBERT W.

Report on the manufacture of paper and paper pulp in Burma. Prepared by order of the Government of India. Rangoon. Office Supt. Govt. Printing, Nov., 1906.

36 p. map. fol.

SINDALL, ROBERT W.

Wood pulp and papermaking materials. Paper Maker lv, 250-251 (Mar. 1, 1918).

Sisal. See *Agave rigida.*

Sisal grass. See *Agava rigida.*

Sisal hemp. See *Agave rigida.*

SKINNER, R. P.

North African grasses for papermaking. Paper Trade J. xlv, No. 26, 44 (Dec. 26, 1907); C. A. ii, 703.

Slender spike rush. See *Eleocharis acuta.*

Slender sword rush. See *Lepidosperma flexuosum.*

Small rush. See *Juncus pauciflorus.*

Small sheathed rush. See *Juncus vaginatus.*

Soft leaved abutilon. See *Abutilon molle.*

Solidago. Goldenrod.

McElhenie, 1910.

Solidago canadensis. Canada goldenrod.

Dodge, C. R., 1897, page 299.

SOME new papermaking materials.

Bull. Imp. Inst. xv, 1-7 (1915); Paper Makers' Mo. J. lv, 279-280 (Sept. 15, 1917).

Sorghum halepense. Johnson grass.
South African grasses, 1918.

Sorghum saccharatum. Sorghum cane.
See *Bagasse.*
See *Saccharum officinarum.*

Sorghum vulgare. Millet.
HAAS, B. Use of *sorghum vulgare* in the cellulose industry. Z. angew. Chem. xxxi, I, No. 33, 84 (1918); C. A. xii, 2438.
Montessus de Ballore, page 277.

Sorgo-sucre. See *Chinese sugar cane.*

Sotal tree.
Davis.

SOURCES of papermaking materials.
Paper xiii, No. 20, 20-21 (Jan. 28, 1914); Sci. Am., Jan. 3, 1914.

Sour sop. See *Anona squamosa.*

SOUTH African grasses for papermaking.
Bull. Imp. Inst. xvi, No. 2, 127-134 (1918); Agr. News xviii, 39 (1919); Paper Maker, Intern. No., 1918-1919, 70-72; Paper xxiv, 711; Papier xxii, 117 (1919); C. A. xiii, 515.

Southern moss. See *Tillandsia usneoides.*

Spanish bayonet. See *Yucca aliofoila.*

Spanish broom. See *Genista aculenta.*
See *Sparticum junceum.*

Spanish esparto.
Paper Making xxxiv, No. 4, 120-122.

Spanish grass. See *Stipa tenacissima.*

Sparganium. Bur-reed.
Davis.

Sparmannia africana.
Dodge, C. R., 1897, page 299.

Spartina cynosuroides. Fresh water cord grass. Cord grass. Marsh grass. Bull grass. Thatch grass.
Dodge, C. R., 1897, page 301.
Hannan, page 137.
Lindsay, 1858.
Little, 1910.
REMINGTON, J. S., BOWAK, D., and DIXON, B. Fresh water cord grass as a source of papermaking material. World's Paper Trade Rev. li, 697 (Apr. 23, 1909); Aynsome Annual ii, 22-33 (1910); Papierfabr. vii, 496-497 (May 14, 1909); C. A. iii, 1590; J. Soc. Chem. Ind. xxviii, 540.
Spon, vol. I, page 997.

Spartina gracilis.
Dodge, C. R., 1897, page 301.

Spartina juncea. Fox grass. Marsh grass. Salt grass. Sea salt grass. Salt marsh grass. Rush marsh grass.

Davis.

Dodge, C. R., 1897, page 301.

McElhenie, 1910.

REMINGTON, J. S., BOWAK, D., and DIXON, B. American salt marsh grass. World's Paper Trade Rev. li, No. 2, 6-8 (Jan. 8, 1909); Aynsome's Annual ii, 12-21 (1910); C. A. iii, 835; J. Soc. Chem. Ind. xxviii, 540.

Spartina townsendii.

PAPER from marram grass and spartina. World's Paper Trade Rev. lxvii, No. 16, 658 (Apr. 20, 1897).

POSSIBLE raw materials for papermaking. Paper Maker lvi, No. 4, 314 (Oct. 1, 1918).

SHRUBSOLE, W. H. Marine grasses for pulp making. Paper Maker lvi, No. 2, 148 (Aug. 1, 1918).

SINDALL, R., and BACON, W. Spartina. Paper Makers' Mo. J. lvi, 132-133 (May 15, 1918).

SPARTINA grass. Paper Makers' Mo. J. lvi, No. 8, 240 (Aug. 15, 1918); Paper xxiii, 207; Pulp Paper Mag. Can. xvi, 1041.

Spartium. Water broom.

Munsell.

Spartium junceum. Spanish broom.

Bull. Misc. Inform., Kew, 1892, pages 53-58; Selected Papers vol. I, page 37.

Dodge, C. R., 1897, page 301.

Hoyer, "Das Papier," 1882, page 8.

Montessus de Ballore, page 276.

Norton, 1910.

Piette.

Spon, vol. I, page 997.

Valetta, 1904.

Spartium scoparium. Wild broom.

Hoyer, "Das Papier," 1882, page 8.

Munsell.

Piette.

Valenta, 1904.

Spatholobus roxburghii.

Phillips, S. C., 1915, page 148.

Spear grass. See *Poa pratensis.*

Spear lily. See *Doryanthes excelsa.*

Sphagnum cymbifolium.

EGOROFF, P., and REMMER, A. Manufacture of paper pulp and half stuff from sphagnum. French Patent 410,835. Sept. 20, 1909. J. Soc. Chem. Ind. xxix, 811.

Sphagnum japonicum. Tundra moss.

TUNDRA moss for papermaking. World's Paper Trade Rev. lviii, No. 19, 928 (Nov. 8, 1912); C. A. vii, 251.

Sphagnum vulgare.

van den Corput.

Spike rush. See *Eleocharis acuta.*

Spinach.

CELLULOSE from spinach. Paper Maker lii, No. 6, 538 (Dec. 1, 1916).

Spindle tree. See *Euonymus.*

Spinifex grass. See *Triodia.*

SPON, EDWARD.

Spon's encyclopedia of the industrial arts, manufactures and commercial products. . . . London, New York, E. and F. N. Spon, 1879-1882.

5 v. illus., tables, diagrs. 26.5 cm.

SPON, EDWARD.

Supplement to Spon's dictionary of engineering, civil, mechanical, military and naval. Ed. by Ernest Spon. . . . . London, New York, E. and F. N. Spon, 1879-1881.

3 vol. illus. 26 cm.

Sporobolus cryptandrus. Prairie grass.

Dodge, C. R., 1897, page 303.

Norton, 1910.

Steek grass. See *Trachypogon polymorphus.*

Steppe grasses.

ZANDERS, H. Suitability of steppe grasses from Togo for papermaking. Wochbl. Papierfabr. xliii, 645-646; C. A. vi, 1671.

Sterculia acerifolia. Flame tree.

Dodge, C. R., 1897, page 304.

Guilfoyle.

Sterculia diversifolia. Victorian bottle tree.

Dodge, C. R., 1897, page 304.

Guilfoyle.

Spon, vol. I, page 997.

Sterculia foetida. Flame tree.

Dodge, C. R., 1897, page 305.

Guilfoyle.

Sterculia lucida. Sycamore.

Dodge, C. R., 1897, page 305.

Guilfoyle.

Sterculia ramosa.

Liotard, page 32.

Sterculia rupestris. Queensland bottle tree.

Dodge, C. R., 1897, page 304.

Guilfoyle.

Spon, vol. I, page 997.

Sterculia spartea. Udal. Currijong.
Dodge, C. R., 1897, page 305.

Sterculia urens. Bottle tree.
Dodge, C. R., 1897, page 305.

Sterculia villosa. Udal.
Dodge, C. R., 1897, page 305.
Spon, vol. I, page 997.

STEWART, C. J., HALL, H. D., and BEADLE, H.
Process and materials for papermaking. English Patent 116,005. Sept. 22, 1917. Paper xxiii, 489.

Stinging nettle. See *Boehmeria.*

Stinkwort.
Earl, J. C., 1916.
Lightfoot, Bull. No. 11, page 36.

Stipa capillata.
Mueller, L., 1877.

Stipa juncea.
Mueller, L., 1877.

Stipa pennata.
Mueller, L., 1877.

Stipa sembarbata.
Mueller, 1867, page 32.

Stipa tenacissima. Esparto grass. Alfa. Halfa. Spanish grass. *Macrochloa tenacissima.*

ALFA GRASS for papermaking. Paper Makers' Mo. J. xlvi, No. 1, 10 (Jan. 15, 1908).

ALFA paper. Papierfabr. viii, No. 6, 125-126 (Feb. 11, 1910).

ARGUS, —. Esparto and wood. Paper Mill xxix, No. 40, 14 (Oct. 6, 1906).

ARNOULD, E. Esparto pulp, a new method of preparation. French Patent 118,376. Papier xxii, 344-345 (Dec., 1919); Pulp Paper Mag. Can. xviii, 917-918 (Sept. 2, 1920); Rev. univ. papeterie iii, 9 (Jan. 15, 1920).

ARNOULD, E. Rational treatment of esparto. Papier xxiii, 99-101 (1920); C. A. xiv, 2553.

ARNOULD, E. Use of esparto pulp in the manufacture of paper. Papier xxii, 250-253 (Aug., 1919); Paper Trade J. lxix, No. 15, 28 (Oct. 9, 1919); C. A. xiii, 2761; Paper xxv, 587.

ARNOULD, E. Wastefulness of the present methods of manufacturing esparto pulp. Papier xxii, 292-293 (1919); C. A. xiv, 121.

BEADLE, CLAYTON. Fibrous constituents of paper. Technics i, ii, iii. 61 pp. 1901-1905.

BEADLE, C., and STEVENS, H. P. Esparto. Papierfabr., Festschrift, 1910, 63-71.

Stipa tenacissima—Continued

BOUBY, P., and DIESS, A. Cellulose from green alfa. French Patent 341,930. Feb. 16, 1904. J. Soc. Chem. Ind. xxiii, 909.

Brand, Circular 82.

BUDDE, C. By-products of esparto grass. J. Soc. Chem. Ind. xxxv, No. 7, 401-404 (Apr. 15, 1916); Paper Makers' Mo. J. liv, 144-145 (May 15, 1916); 179-180 (June 15, 1916).

Charpentier, page 22.

CHEMICAL pulp from alfa grass. Paper Maker lvi, No. 6, 765 (Dec. 1, 1919).

CITTANOVA, J. Esparto. Papier xxii, 270-272 (1919); C. A. xiii, 3314; Paper xxv, 833.

Cross and Bevan, page 109.

Dodge, C. R., 1897, page 306.

DUBROT, F. E. M. Manufacture of half stuff from esparto. French Patent 430,230. Aug. 4, 1910. J. Soc. Chem. Ind. xxx, 1308.

DUBROT, F. E. M. Paper pulp from alfa grass. French Patent 486,226. Mar. 19, 1918. C. A. xiii, 1930.

ECHEGUT, L. Manufacture of paper pulp from graminaceous plants and more especially from esparto, diss and the dwarf palms. French Patent 359,550. Nov. 6, 1905. J. Soc. Chem. Ind. xxvi, 388.

ESPARTO. Chem. Trade J., 1889, 97-98, 115-116, 130-131; J. Soc. Chem. Ind. viii, 813.

ESPARTO—an historical and economic review. Paper ix, No. 3, 20-22 (Oct. 2, 1912).

ESPARTO grass for paper pulp. Paper iii, No. 13, 9-10 (June 14, 1911).

ESPARTO half stuff. World's Paper Trade Rev. lvi, 974; C. A. vi, 422.

ESPARTO half stuff in Tunis. Paper Trade J. xlix, No. 11, 30 (1909).

ESPARTO, its preparation and market price. Paper Trade J. xlix, No. 10, 24 (1909).

ESPARTO or wood pulp. Pulp Paper Mag. Can. iii, No. 8, 250-251 (Aug., 1905).

ESPARTO pulp. Paper Making xxvii, No. 4, 152-153 (Apr., 1908).

ESPARTO pulp by bacteriological fermentation. Pulp Paper Mag. Can. iv, No. 4, 99-100 (Apr., 1906).

ESPARTO pulp making in Algeria. Paper Making xxvii, No. 11, 432 (Nov., 1908).

FRANCE'S resources in papermaking materials. L'Industria della carta, June 1, 1918; Paper xxii, No. 18, 512-513 (July 10, 1918).

Stipa tenacissima—Continued

FRENCH view on esparto. Pulp Paper Mag. Can. iv, 131 (May, 1906).

GEARE, R. I. Esparto grass for the manufacture of paper. Paper Trade J. lx, No. 15, 44-46 (Apr. 15, 1915); Paper Maker xlix, No. 6, 661 (June 1, 1915); Pulp Paper Mag. Can. xiii, No. 9, 272-273 (May 1, 1915).

Griffin and Little, page 131.

GROUD, CH. The esparto industry. Papier xxiii, 27-30 (Feb., 1920); C. A. xiv, 1896.

Hannan, page 131.

HAUSER, H. Esparto pulp. World's Paper Trade Rev. lxvii, No. 8, 2-3 (Feb. 23, 1917).

HAUSER, H. French may develop alfa pulp manufacture. Paper xix, No. 19, 13-14 (Jan. 17, 1917).

HISTORY of the introduction of esparto. World's Paper Trade Rev.; Papierfabr. vii, No. 29, 726-727 (July 23, 1909).

Hofmann, 1873, 297-299; 1897, 1210-1230.

Höhnel, page 114.

Hoyer, 1887.

Hübner, 1903, page 12.

IMPORTANT esparto grass factory. Paper Making xxix, No. 12, 473-474 (Dec., 1910).

KEMP, EDWIN C. Esparto grass. Commerce Reports, Apr. 3, 1918, page 40; Paper xxii, No. 14, 385-386 (June 12, 1918); Paper Trade J. lxvi, No. 15, 32 (Apr. 11, 1918).

Kirchner, vol. II, page 56.

KLIMSCH, JOS. C. Treating fibrous materials for paper stock. U. S. Patent 256,436. Apr. 11, 1882. J. Soc. Chem. Ind. i, 199 (1882).

KOCH, C. J. The commercial importance of esparto grass. Tropenpflanzer xviii, 59-79; Paper xiv, No. 6, 21 (Apr. 22, 1914); C. A. viii, 2803.

KUESS, M. Conversion of alfa and similar plants into paper pulp. French Patent 96,981. May 8, 1905. J. Soc. Chem. Ind. xxiv, 1081.

LITTLE, ARTHUR D. A new material for American paper mills. Chem. Eng. xv, 125; C. A. vi, 1525.

LOTTE, —. Alfa. Papeterie, Aug. 15, 1910, page 377.

LOWSON, J. G. F. Problems in papermaking. J. Soc. Chem. Ind. xviii, 996-997 (1899).

MANETTI, CARLO. Lo sparto nell' Afreica settentrionale (*Stipa tenacissima—Lygeum spartum—Ampelodesmos mauritanicus—Aristida pungens*). Firenze, Institudo agricola coloniale italiono, 1914.

96 p. illus. xiv pl. (part col. and incl. front., 2 maps) on 11 p. 25 cm.

Esparto in northern Africa.

Stipa tenacissima—Continued

MANGANO, GUIDO. L'Alfa in Tripolitania. Firenze-Milano, Fratelli Treves, 1913.

2 p. l., 78 p. incl. plates. 19 cm.

Alfa in Tripoli.

MASON, D. B. Esparto industry of Algeria. Daily Consular and Trade Reports, June 27, 1912, page 433.

MILNE, S. Refining esparto pulp. English Patent 14,070. June 11, 1914. Paper Maker 1, 284; C. A. ix, 3357; J. Soc. Chem. Ind. xxxiv, 867.

Montessus de Ballore, page 149.

MONTESSUS de BALLORE, HENRY de. The advantage of establishing an alfa mill in northern France. Lille, 1913.

MONTESSUS de BALLORE, HENRY de. Alfa et papier d'alfa. Imprime sur papier d'alfa. Paris, H. Dunod et E. Pinat, 1909.

2 p. l., 73 p., illus. plates, fold. map. 25.5 cm.

Alfa and alfa paper—Printed on alfa paper.

MONTESSUS de BALLORE, HENRY de. Pulp for the manufacture of paper. French Patent 322,921. July 12, 1902. J. Soc. Chem. Ind. xxii, 437.

PAPER from Florida saw grass or esparto. World's Paper Trade Rev. liii, No. 8, 7.

PORTEMONT, J. M. de. The esparto industry in Africa. Papier xxii, 237-239 (Aug., 1919); Paper xxv, 586.

FORTEMONT, J. M. de. Production of esparto in Northern Africa. Papier xxii, 161 (June, 1919); Paper xxv, 612.

RAITT, W. Paper pulp. English Patent 16,488. Nov. 12, 1915. C. A. xi, 1546.

REMINGTON, J. S., BOWAK, D. A., and DAVIDSON, P. W. American saw grass. World's Paper Trade Rev. liv, 299; C. A. v, 197.

RICHTER, ERICH. Esparto—soda process. Pulp Paper Mag. Can. xi, No. 16, 575-578 (Aug. 15, 1913); Paper xii, No. 12, 20-22, No. 13, 17-18 (Sept. 3, 10, 1913).

ROUTLEDGE, THOMAS. A short account of the introduction of esparto as a papermaking material. Compiled by J. P. Cornett. Thomas Reed and Co., Sunderland, 1909.

27 pages.

Royle, 1855, page 31.

SKINNER, R. P. North African grasses for papermaking. Paper Trade J. xlv, No. 26, 44 (Dec. 26, 1907); C. A. ii, 703.

Spon, vol. I, page 979.

STRONG, F. F. New source of pulp supply. Paper Trade J. Feb. 20, 1913, page 313; Paper xi, No. 11, 19 (1913); Paper Maker lv, 745 (Nov., 1913).

STRONG, F. F., and ELLIE, H. E. Paper from Florida

Stipa tenacissima—Continued

saw grass or esparto. World's Paper Trade Rev. lxii, No. 8, 335 (Aug. 21, 1914).

TRABUT, L. Etude sur l'halfa (*Stipa tenacissima*). Alger, 1889.

100 p. 22 pl. 8°.

Study of *esparto.*

TREATMENT of esparto (Dubrot process). Papier xxii, 203-207 (1920); C. A. xiv, 1754.

TUNISAN alfa grass. Paper Maker lvi, 246 (Sept. 2, 1918).

WILSON, RIPLEY. Esparto grass for papermaking. Daily Consular and Trade Reports, 1913, page 774.

YOST, B. F. Esparto industry in Algeria province. Daily Consular and Trade Reports, No. 165, 306-308 (1914); Expt. Sta. Rec. xxxi, 832; Paper xiv, No. 21, 30 (Aug. 5, 1914).

YOUNG, J. B. Esparto grass for paper pulp. Daily Consular and Trade Reports, Oct. 20, 1912, page 487.

Stolpoddo. See *Hibiscus mutabilis.*

Stramonium. See *Datura stramonium.*

Straw.

ABADIE, AUG. How straw papers are made in France. Paper Trade J. lii, No. 3, 44 (Jan. 19, 1911); Paper Makers' Mo. J. xlix, No. 2, 47-48 (Feb. 15, 1911); No. 5, 161-163 (May 15, 1911); C. A. v, 3515.

ABADIE, AUG. Making straw available for fine papers. Paper vi, No. 9, 18 (Feb. 14, 1912).

ALTMANN, E. Straw cellulose manufacture in Russia. Papierfabr. xi, No. 34, 1020-1022 (1913).

ALTMANN, E. Straw pulp manufacturer in Russia. Chem.-Ztg. xxxv, 979 (1911); Paper Making xxx, No. 10, 369 (Oct., 1911); C. A. vi, 422.

ALTMANN, PAUL ERNST. Die Strohstoff Fabrikation; Handbuch für Studium und Praxis, mit sieben Afteilungen. Berlin, M. Krayn, 1914.

31 p. illus. pl. 25.5 cm.

The manufacture of straw pulp; handbook for study and practice, with seven illustrations.

ANDES, LOUIS EDGAR. Die Verarbeitung des Strohes zu Geflechten und Strohhüten, Matter, Flaschenhülsen, Seilen, in der Papierfabrikation und zu vielen anderen Zwecken. Ein Hand- und Hilfsbuch für Strohhutfabrikanten, Landwirtschaften u. s. w. Wien, A. Hahtleben, 1898.

The preparation of straw for braided work and straw hats, mats, bottle cases, ropes, for the manufacture of paper and for many other purposes. A manual for strawbraiding mills, basketry schools, manufacturers of straw hats, agriculturists, etc.

Straw—Continued

Beadle, C., 1901, page 9.

BEVERIDGE, JAMES. Manufacture of paper pulp from straw. Pulp Paper Mag. Can. xiv, No. 10, 225-226, 250 (May 15, June 1, 1916); Paper xviii, No. 1, 18-19 (Mar. 15, 1916); No. 6, 13-15 (Apr. 19, 1916); C. A. x, 1267.

BEVERIDGE, JAMES. Manufacture of straw cellulose. J. Soc. Chem. Ind. xiii, 101, 107, 213 (Feb. 28, Mar. 31, 1894).

BOHN, L. K. Manufacture of paper from straw. English Patent 14,035. Aug. 4, 1900. J. Soc. Chem. Ind. xix, 1034.

BOHN, L. K. Paper pulp from straw. U. S. Patent 875,-315. Dec. 31, 1907. Papier-Ztg. xxxiii, 269 (Jan. 26, 1908); Paper Makers' Mo. J. xlvi, No. 2, 48 (Feb. 15, 1908); C. A. ii, 1205, 1344.

BOMEISTER, L. Manufacture of fine white writing paper from straw. U. S. Patent, Sept. 10, 1829.

BUROT, M. Note sur la fabrication du papier de paille dans le Limousin. Paris, 1883.

44 p. 1 pl. 8° (Extract: Mêmoirs de lar société des ingenieurs civils, May, 1883).

Note on the manufacture of paper from straw in the Limousin.

CLARK, W. Process for making paper from straw. U. S. Patent 14,804. May 6, 1856.

COBLEY, T. H. Improvements in the treatment of straw, straw refuse, and other fibrous materials for the manufacture of pulp and manure. English Patent 3,559. July 23, 1883. J. Soc. Chem. Ind. iii, 328.

CRESSON, C. M. Manufacture of paper pulp from straw. U. S. Patent 116,933. July 11, 1871.

Cross and Bevan, page 111.

DEAN, L. Preparation of straw for the manufacture of paper. U. S. Patent 109,596. Nov. 29, 1870.

DIETZ, R. Manufacture of straw cellulose by the sulfite process. Z. angew. Chem. xxviii, 648-653 (1905); J. Soc. Chem. Ind. xxiv, 557.

DUTCH paper and strawboard. Paper Making xxx, No. 12, 459-460 (Dec., 1911).

EATON, E. K. Manufacture of paper pulp from straw. U. S. Patent 41,982. Mar. 22, 1864.

EVOLUTION in the use of straw for pulp. Paper Trade J. xlii, No. 15, 40, 42 (Apr. 12, 1906).

FRENCH straw papers. Papier-Ztg. xvi, 2611 (1891); J. Soc. Chem. Ind. xi, 56.

GIAJ-TENUA, D. Treatment of straw, jute, etc. French Patent 357,374. Aug. 31, 1905. J. Soc. Chem. Ind. xxv, 88; Pulp Paper Mag. Can. v, No. 4, 89-90 (Apr., 1907).

GOODE, J. Manufacture of straw pulp. English Patent 18,157. Sept. 11, 1901. J. Soc. Chem. Ind. xxii, 109.

Straw—Continued

GOTTSTEIN, L. Manufacture of straw cellulose by the sulfite process. Z. angew. Chem. xviii, 983-984 (1905); J. Soc. Chem. Ind. xxiv, 748.

GRIFFIN, M. L. Straw pulp and paper. Paper mill xliii, No. 32, 2, 34 (Aug. 7, 1920); Paper Making xxxix (No. 9. 266-269 (Sept., 1920).

Griffin and Little, page 129.

HAAS, B. Manufacture of straw pulp and board. Papier-fabr. xii, No. 11, 305-312; Paper xiv, No. 9, 19 (May 13, 1914); C. A. viii, 1871.

HAXSTUN, A. K. Manufacture of paper pulp from straw. U. S. Patent 52,994. Mar. 6, 1866.

HEUSER, E. and HANG A. Nature of the cellulose of cereal straw. Z. angew. Chem. xxxi, 99-100, 103-104, 166-168, 172-176 (1918); J. Soc. Chem. Ind. xxxvii, 365A, 650A.

Hoffmann, 1873, pages 255-296; 1897, pages 1089-1209.

Hoyer, 1887.

Hübner, 1903, page 14.

IVERSEN, J. M., and TRACY-GOULD, A. V. Sulfate of soda pulp of straw. Pulp Paper Mag. Can. xi, No. 12, 409-411 (June 15, 1913).

KENNEDY, MICHAEL R. Obtaining fiber from straw. U. S. Patent 951,317. Mar. 8, 1910. C. A. iv, 1543.

KENNEDY, P. B. British utilization of straw for papermaking. Commerce Reports, No. 247, pages 280-281 (Oct. 21, 1918).

Kirchner, vol. II, page 43.

KLIMSCH, J. C. Treating fibrous materials for paper stock. U. S. Patent 256,436. Apr. 11, 1882. J. Soc. Chem. Ind. i, 199.

Knoop, M., 1800.

KNOOP, M. See Paper Making xxx, No. 11, 422 (Nov., 1911).

KRAFT pulp from straw. Papier-Ztg. xxxiii, 404 (Feb. 6, 1908); C. A. ii, 1344.

LAPPEN, J. E. Paper stock from straw. U. S. Patent 1,236,723. Aug. 14, 1917. World's Paper Trade Rev. lxviii, No. 16, 635 (Oct. 19, 1917); Paper xxi, No. 1, 16 (Sept. 12, 1917); Paper Trade J. xliv, No. 15, 46 (Oct. 11, 1917).

LENG, C. D. Straw for papermaking. Paper Makers' Mo. J. lvi, 38 (Feb. 15, 1918).

Lightfoot, Bull. No. 11, page 35.

MAGAW, W. Making paper from straw, hay, etc. U. S. Patent, Mar. 8, 1830.

MANUFACTURE of pulp from straw. Paper vii, No. 10. 18-19 (May 22, 1912).

Straw—Continued

MANUFACTURE of straw cellulose. Paper viii, No. 2, 24-25 (June 26, 1912).

MANUFACTURE of straw half stuff. Paper Maker xlviii, No. 4, 555 (Oct. 1, 1914).

MANUFACTURE of strawboards. Paper Making xxxvi, No. 12, 383 (1917); Pulp Paper Mag. Can. xvi, 163.

Mierzinski, page 57.

Montessus de Ballore, page 241.

MONTESSUS de BALLORE, H. de. Barley straw as raw material for paper. Papier-Ztg. xxxi, 1534 (May, 1907); C. A. i, 2489.

PAPER from straw. Paper Making xxxvi, No. 10, 318-319.

PAPERMAKING in South Australia. Paper Maker, Intern. No., 1916-1917, pages 11, 21.

PODMORE, J. E. Separating fiber from straw. U. S. Patent 953,287. Mar. 29, 1910. C. A. iv, 1544.

PRIESTLY, J., and BRADBURY, T. C. Preparing paper pulp from straw. U. S. Patent 55,706. June 19, 1866.

PROCESS for cooking straw and similar fibers. Papier-Ztg. xxxiii, 444 (Feb. 9, 1908); C. A. ii, 1186.

PROPERTIES of straw pulp. Paper xiv, No. 6, 20 (Apr. 22, 1914).

REICHMANN, F. Treatment of straw, grasses, etc. German Patent 217,159. Nov. 3, 1907. C. A. iv, 1544.

RICHTER, ERICH. Developments of the straw pulp industry. Pulp Paper Mag. Can. xi, No. 15, 504-505 (Aug. 1, 1913); Paper xii, No. 12, 20-22; No. 13, 17-18 (Sept. 2, 10, 1913); Paper Maker xlvi, No. 3, 394-396 (Sept. 1, 1913); C. A. vii, 3662.

ROTHE, J. A. Manufacture of pulp from straw. U. S. Patent 121,130. Nov. 21, 1871.

SCHACHT, W. Straw pulp. Paper Trade J. xliv, No. 6, 219-220 (Feb. 7, 1920).

SCHLICK, LEO. Manufacture of strawboard and straw paper. Pulp Paper Mag. Can. xi, No. 4, 123-125; No. 6, 190-191 (Feb. 15, Mar. 15, 1913).

SHERWOOD, R. Reducing straw and other fibrous substances f · the manufacture of paper pulp. U. S. Patent 45,440. Dec. 13, 1864.

SINDALL, R., and BACON, W. Straw pulp. Paper Makers' Mo. J. lvi, No. 8, 228 (1918); Paper xxiii, 231.

SMART, R. T., I. W., and A. I. Manufacture of paper from straw. U. S. Patent 27,653. Mar. 27, 1860.

STRAW as a basis for paper. Can. Municipal J. xiii, 328 (1917).

STRAW as paper raw material. Papier-Ztg. xxxviii, 2806 (Sept. 21, 1913); Paper xv, No. 15, 19-20 (Dec. 23, 1914).

Straw—Continued

STRAW cellulose. Wochbl. Papierfabr. 1, No. 2, 77-78; No. 8, 429; No. 9, 489 (1918).

STRAW paper. Papier-Ztg. xxv, 3679 (1900); J. Soc. Chem. Ind. xx, 148.

STRAW paper in Holland. Papier-Ztg. xxxix, No. 10, 304-305 (Feb. 1, 1914).

STRAW pulp. Paper Makers' Mo. J. lvi, No. 8, 228 (1918); Pulp Paper Mag. Can. xvi, 2005; Paper xxiii, 231.

STRAW pulp making. Paper Making xxxiii, No. 11, 415-418.

SULFATE straw cellulose. Paper Making xxxii, No. 7, 260 (1913).

SURPLUS straw. Paper Makers' Mo. J. lv, No. 10, 302-303 (Oct. 15, 1917).

TIFFANY, J. Preparing paper pulp from straw. U. S. Patent 68,261. Aug. 27, 1867.

TOCHER, J. F. Utilization of straw for papermaking. World's Paper Trade Rev. lxviii, No. 12, 450 (Sept. 21, 1917); Paper Maker liv, No. 4, 335-337 (Oct. 1, 1917); Paper xxi, No. 6, 22-23 (Oct. 17, 1917); J. Soc. Chem. Ind. xxxvi, No. 19, 1043; C. A. xii, 764.

TURNING to straw in England. Paper xxiii, No. 1, 4-5 (Sept. 11, 1918); Paper Makers' Mo. J., Aug. 15, 1918.

WERNER, E. E.—Paper pulp from straw and similar materials. U. S. Patent 1,347,979. July 27, 1920. C. A. xiv, 2858.

WREDE, HANS. Why not make white straw pulp here. Paper ii, No. 2, 9-10 (Dec. 28, 1910).

WÜG, CARL B. Obtaining pulp from straw, cornstalks, etc. U. S. Patent 1,084,244. Jan. 13, 1914. C. A. viii, 1010.

Streaked lantern flower. See *Abutilon striatum.*

Strebulus asper. Trophis asper. Ton khoi.

Bull. Misc. Inform., Kew, 1888, 81-84; Selected Papers, vol. I, page 46.

Strelitzia angusta. Wild banana.

Juritz, page 70.

Strelitza regina.

Davis.

Stringy bark. See *Eucalyptus obliqua.*

STROTHER, DAVID H.

Paper and paper plants of Mexico. Consular Reports xxvii, 58-60 (Jan., 1883).

Structural bamboo. See *Bambusa blumeana.*

STUDY of papermaking fibers.

Paper i, No. 4, 9-11; No. 5, 11-17, 19 (Oct. 12, 191, 1910).

Subai grass. See *Ischaemum angustifolium.*

SUBSTITUTES for foreign papermaking materials.
Wochbl. Papierfabr. xlviii, No. 12, 518-519 (1917).

SUBSTITUTES for rags in papermaking.
Paper Maker lii, No. 1, 55 (July, 1916).

Sugar beet cellulose.
ARENDT, C., and ROYERE, G. de la. Process of manufacturing paper. German Patent 154,754. Dec. 24, 1902. J. Soc. Chem. Ind. xxiv, 454.

Sugar cane. See *Saccharum officinarum.*

Sultana bark.
Munsell.

Sumac. See *Ailanthus.*

Sunflower. See *Helianthus.*

Sunn hemp. See *Crotalaria juncea.*

Swamp moss. See *Conferva.*

Swamp rose mallow. See *Hibiscus moscheutos.*

Swamp tea tree. See *Melaleuca.*

Sweet broom. See *Cytisus.*

Swingle tow.
Munsell.

Sword grass. See *Gahnia psittacorum.*
See *Lepidosperma elatius.*

Sword rush. See *Lepidosperma gladiatum.*

Sword sedge. See *Lepidosperma gladiatum.*

Sycamore. See *Sterculia lucida.*

T

Talihib grass. See *Saccharum spontaneum.*

Talipot palm. See *Corypha umbraculifera.*

Tall palm lily. See *Cordyline indivisa.*

Tall sword grass. See *Lepidosperma elatius.*

Tambookie grass. See *Cymbopogon nardus.*

Tan bark.
Kress. Paper Maker lii, No. 6, 536 (Dec. 1, 1916). I.e Normand.

Tang. See *Zostera marina.*

Tea plant. See *Sida rhombifolia.*

Tea Tree. See *Melaleuca armillaris.*

Tekapu. See *Celmisia coriacea.*

Tetrapanax papyrifera. See *Aeschyomene paludosa.*

Thatching grass. See *Andropogon buchananii*
See *Spartina cynosuroides.*

Theneda forskalii (mollissima).
INVESTIGATION of materials suggested for the manufacture of paper. Bull. Imp. Inst. xvii, No. 2, 145-146 (1919).

Thick-leaved pittesporum. See *Pittesporum crassifolium.*

Thistle. See *Cardua nutans.*

Thornapple. See *Datura stramonium.*

Thymeloca microphylla. Metnane.

RUBT, A. New raw materials. Paper xxiii, No. 18, 479-481 (Jan. 8, 1919).

Ti kouha. See *Cordyline australis.*

Tie plant of Australia. See *Commersonia fraseri.*

Tikkur.

Davis.

Tilia europeae. Lime tree.

Cross and Bevan, page 108.

Dodge, C. R., 1897, page 313.

Royle, 1855, page 391.

Tillandsia usneoides. Long moss. Southern moss. Black moss.

Dodge, C. R., 1897, page 314.

Lindsay.

Mueller, L., 1877.

Timothy (hay). See *Phleum pratense.*

Tobacco. See *Nicotiana.*

TOLHAUSEN, A.

Woody fiber from the haulms, stems or stalks of potatoes, hops, beans, peas, bracken and similar plants. English Patent 20,613. Oct. 14, 1899. J. Soc. Chem. Ind. xix, 1033.

Tomatoes.

ROVESTI, G. Use of residue from the manufacture of preserved tomatoes. Bull. soc. hyg. i, 585-588 (1911); Expt. Sta. Rec. xxviii, 660.

Ton hkoi. See *Strebulus asperi.*

Too. See *Cordyline indivisa.*

TOOTHAKER, CHARLES ROBINSON.

Commercial raw materials; their origin, preparation and uses. . . . The Philadelphia museum, 1905.

3 p. l., 108, ix p. incl. front. illus. maps. 26 cm.

Tow.

Munsell.

Tracema indivisa.

Davis.

Trachycarpus excelsa. Chinese coir palm.

Hannan, page 129.

Trachypogon polymorphus. "Steek grass."

INVESTIGATION of materials suggested for the manufacture of paper. Bull. Imp. Inst. xvii, No. 2, 143 (1919).

Traphis.

Davis.

Travancore sacking tree. See *Antiaris toxicaris.*

Tree mallow. See *Lavatera arborea.*

Tree moss.
Schaeffer.

Tree nettle. See *Laportea giga.*

Trifolium. Clover.
Davis.

Triodia irritans. Porcupine grass.
Dodge, C. R., 1897, page 313.
Hannan, page 137.
Spon, vol. I, page 998.

Triodis sp. Spinefex grass.
Lightfoot, Bull. No. 11, page 33.

Triraphis madagascariennis. See *Savannah grass.*

Tristachya rehmanni.
INVESTIGATION of materials suggested for the manufacture of paper. Bull. Imp. Inst. xvii, No. 2, 147-148 (1919).

Triticum repens. Dog grass. Couch grass. Dog wheat. Knot grass. Twitch grass. Quitch. Quickens.
Hannan, page 126.
Lindsay, 1858.
TWITCH as a papermaking material. Paper Maker lv, No. 6, 547 (June 1, 1918).

Triticum sativa. Wheat.
Dodge, C. R., 1897, page 316.
Earl, 1916.
Piette.
See also *Straw.*

Triticum vulgare. Wheat.
Mueller.
See alsó *Straw.*

Tritoma recurvata.
Hannan, page 137.

Tritoma uvaria. Poker plant.
Hannan, page 137.

Trophis asper. See *Strebulus asper.*

TROPICAL grasses as papermaking material.
Paper Maker, 1918-1919, page 45.

Trumpet tree. See *Cecropia.*

Tule grass. See *Scirpus lacustris.*

Tulip tree. (Leaves).
Davis.

Tundra moss. See *Sphagnum japonicum.*

Tumeric. (Stem and leaves.)
Davis.

Turf. See *Peat.*

Turkish cornstalk or **wheat.** See *Zea mays.*

Turnip. See *Brassica.*

Tussilago. Coltsfoot.
Lindsay, 1858.
Villette.

Tussock grass. See *Poa coespitosa.*
See *Xerotes longifolia.*

Twitch grass. See *Triticum repens.*

Tylophora asthmatica. Pubescent tylophora.
Liotard, page 34.

Typha angustifolia. Bulrush.
Charpentier.
Dodge, C. R., 1897, page 3189.
Lindsay, 1858.
Mueller, 1867, page 33.
Watt.

Typha elephantia. Reed mace. Elephant grass.
Hannan, page 132.

Typha latifolia. Cat tail. Cat tail flag. Elephant grass.
Dodge, C. R., 1897, page 319.
Dodge, J. R. Annual Report, Dept. of Agr., 1879.
KLEIN, A. Typha fiber. Papier-Ztg. xliii, No. 23, 510 (1918).
Mierzinski, page 12.

Typha medica.
COLLINS, EUGENE. Typha fiber suggested cotton substitute. Paper xxii, No. 2, 23 (Mar. 20, 1918).

U

Udal. See *Sterculia villosa.*

Ulex europeaenus. Furze. Gorse.
HORTLEOUP, G. P. Manufacture of paper pulp. French Patent 327,136. English Patent 26,149. Nov. 30, 1903. J. Soc. Chem. Ind. xxii, 879.

Ulla grass.
INDIAN papermaking material. World's Paper Trade Rev. lxiii, No. 22, 912 (May 28, 1915).
ULLA grass as a raw material. Papier-Ztg. xliii, No. 83, 1933 (1918).
WORKING of "ulla" grass lands. Paper Maker lvi, No. 6, 568 (Dec. 2, 1918); Independent xliii, 11-12, 479-488 (Nov., Dec., 1917).

Ulmus. Elm.
Davis.

Ulva marina.
COLLIER, E. H. Making paper from the *Ulva marina.* U. S. Patent, Apr. 25, 1828.
Munsell.

Uniola racemiflora. West Indian grass.
Dodge, C. R., 1897, page 320.

UNITED STATES. BUREAU OF FOREIGN COMMERCE.
Special Consular Reports, vol. 19. Paper in foreign countries. Use of wood pulp. Govt. printing office, 1900. 517 pp.

Upas tree. See *Antiaris toxicaria.*

Urania. See *Guazuma ulmifolia.*
See *Madagascariensis.*
See *Melochia biliacefolia.*
See *Pterospermum acerifolium.*

Urena lobata. Cæsar weed. Bun ochra.
Dodge, C. R., 1897, page 321.
Liotard.
SOC. ANON. DES ETABLISSEMENTS A. OLIER. Cellulose for papermaking. English Patent 138,911. Feb. 11, 1920. C. A. xiv, 2084.
Spon, vol. I, 999.

Urena sinuata.
Mierzinski, page 31.

Urtica candicans.
Mueller, L., 1877.

Urtica dioica. Common stinging nettle of Europe.
Cross and Bevan, page 106.
Dodge, C. R., 1897, page 323.
Kirchner, vol. II, page 74.
NETTLE fiber and reed. Wochbl. Papierfabr. xlviii, No. 10, 423-424 (1917); xlix, No. 47, 2395 (1918).
Piette.
Schwarz, 1909.
Strothers, 1883.

Urtica divaricata. Giant nettle.
Davis.
Mueller.

Urtica heterophylla. Neilgherry nettle.
Lindsay, 1858.
Watt.

Urtica incisa. Victorian nettle.
Archer.

Urtica nivea.
Montessus de Ballore, page 258.
Norton, 1910.
See also *Boehmeria.*

Urtica tenacissima.
BERGET, A. Paper pulp from crude plants. U. S. Patent 683,836. J. Soc. Chem. Ind. xxi, 64.
Montessus de Ballore, page 258.
Spon, vol. I, page 999.

Water weeds. See *Elodium canadensis.*

Wattle barks. See *Acacia decurrens.*

Wayfaring tree.

Villette.

Weeds.

Davis.

LETORRE, JEAN. Weed grasses as a source of paper pulp. Rev. univ. papeterie ii, No. 9, 4-5 (Sept. 15, 1919); Paper xxv, 833; C. A. xiv, 121.

McElhenie, 1910.

PAPER pulp from weeds possible. Paper Maker xlviii, 701 (Nov., 1914); 102 varieties said to have been used.

STEWART, —. Utilizing weeds. Paper Makers' Mo. J. li, 120-121 (Mar. 15, 1913).

WEEKS, LYMAN H.

The search for raw material.

See his "History of papermaking in the United States, 1690-1916," chapter 11, pages 211-238. New York: The Lockwood Trade Journal Company, 1916.

West Indian grass. See *Uniola racemiflora.*

Wheat. See *Triticum.*

White cotton tree. See *Eriodendron anfractuosum.*

White laun. See *Shorea contorta.*

White mulberry. See *Morus alba.*

White sweet clover. See *Melilotus alba.*

Wickstroemia canescens. Gampi. Ganpi.

Dodge, C. R., 1897, page 327.

DODGE, C. R. Japanese paper fibers. Pulp Paper Mag. Can. ii, 196 (July, 1904); Paper Trade Rev., June 30, 1904.

Höhnel.

Kirchner.

Lauboeck, 1893.

Martens, 1889.

PAPERMAKING in Japan. Paper xxiii, No. 21, 566-568 (Jan. 29, 1919).

POIRIER, F. Paper made from the bark of kodzou and of gampi. English Patent 20,616. Sept. 30, 1908. C. A. iv, 827.

Raines, 1913.

Setlik.

Valenta.

Wild broom. See *Spartium scoparium.*

Wild date palm. See *Phoenix sylvestris.*

Wild hemp. See *Mautia puya.*

Wild mallow.

ONE more new raw material. Paper Making xxvii, No. 11, 439 (Nov., 1908).

Wild pineapple. See *Bromelis.*
See *Karatas plumieri.*
Wild plantain. See *Musa textilis.*
WILD PLANTS of Queensland (Australia) which can be used for the extraction of textile fibers and for the manufacture of paper. Queensland Agr. J. vi. 235-238 (1916); Bull. Agr. Intelligence viii, 239-240; C. A. xi, 3447.
Willow. See *Salix alba.*
Willow herb. See *Epilobium angustifolium.*
Wire grass. See *Ehrharta tenacissima.*
See *Poa coespitosa.*
Wolfsbane. See *Aconitum.*
Woolen grass. See *Typha.*
Wormwood. See *Artemisia maxa.*
Wrack. See *Fucus vesiculosus.*

X

Xanthorrhoea minor.
Mueller, L., 1867, page 33.
Xanthorrhoea preissii. Black bay tree.
Phillips, S. C., 1915, page 259.
Xanthorrhoea semiplana. Grass tree.
Earl, J. C., 1916, 1917.
Lightfoot, Bull. No. 11, page 36.
Xerotes longifolia. Tussock grass. Australian mat rush. Toothed dry-rush.
Hannan, page 139.
Mueller, 1867, page 32.
Spon, vol. I, page 999.

Y

Yellow water iris. See *Iris pseudoachorus.*
Yercum. See *Calatropis gigantea.*
Yucca.
WALKER, GEORGE B. Manufacture of pulp. English Patent 5,306. J. Soc. Chem. Ind. iv, 133 (1885).
Yucca aloifolia. Spanish bayonet.
Charpentier.
Dodge, C. R., 1897, page 331.
Yucca angustifolia.
Piette.
Yucca baccata.
Dodge, C. R., 1897, page 331.
Yucca brevifolia. Needle palm.
Davis.
Hannan, page 135.
Yucca draconis.
Mueller.

Yucca filamentosa. Bear grass. Adam's needle.
Dodge, C. R., 1897, page 332.
Liotard.

Yucca gloriosa. Adam's needle.
Watt, vol. VI, part I, page 108.

Yucca puberula.
Davis.

Z

Zacaton. See *Epicampes macroura.*

Zamia palm. See *Macrozamia spiralis.*

Zea mays. Indian corn. Corn. Maize.

ALLISON, B., and HAWKINS, J. Manufacture of paper from corn husks. U. S. Patent, December 30, 1802.

AUER von WELSBACH, A. C. Manufacture of paper from husks of Indian corn. U. S. Patent 38,220. April 21, 1863.

AUER von WELSBACH, A. C. Use of corn fiber for manufacture of paper and fiber. Ding. polytech. J. clxx, 71-73 (1863).

AUER von WELSBACH, A. C. Use of corn plant. Ding. polytech. J. clxvi, 413-420 (1862).

AUFERMANN, WILLIAM. Corn fiber and its uses. A history of the discoveries and inventions of Chevalier Auer von Welsbach. Patented in the United States, April 21, 1863. New York, J. A. Gray and Green, printers, 1865.

30 p. 21.5 cm.

AUSTRIA. Central Comite für die Agricultur-, Industrie,- und Kunst-Ausstellung zu London, 1862.

Oesterreich auf der Internationalen Ausstellung, 1862. Im Auftrage des K. K. Ministeriums für Handel und Volkswirtschaft von Prof. Dr. Jos. Arenstein. Maisfaserpapier. Wien. Aus der K. K. Hof- und Staatsdruckerei. 1862.

5 p. l., xlviii, 128 p. illus., 25.5 cm.

Central committee for the exposition of agriculture, industry and art, London, 1862. *Austria at the international exposition of* 1862. *Paper from corn fiber.*

Also published in English in London. International exhibition, 1862. The illustrated catalogue of the industrial department . . . (London, 1862), v. 4. Printed on maize paper

"Utility of the Maize Plant," by Dr. Alois Ritter Auer von Welsbach; 4 p. at end.

Also published in French.

BACHE-WÜG, C. Obtaining pulp from straw, etc. U. S. Patent 1,084,244. Jan. 13, 1914. C. A. viii, 1010.

Brand, Charles J., 1911.

Zea mays—Continued

BURTON, G. D. Paper pulp from cornstalks. U. S. Patent 1,123,166. Dec. 29, 1914. C. A. viii, 2947; J Soc. Chem. Ind. xxxiv, 222.

BURTON, G. D. Pulp from cornstalks. U. S. Patent 1,199,241. Sept. 20, 1916. C. A. x, 3160.

COBBETT, —. A treatise on Cobbett's corn. (Corn husk paper.) London, 1828.

COBBETT'S corn paper. World's Paper Trade Rev. lxvi, No. 20, 38-39.

COOPER, J. W. Manufacture of paper from rags and straw and corn husks. U. S. Patent, Feb. 7, 1829.

CORNSTALKS as stock. Paper Makers' Mo. J. xlvii, No. 12, 432 (Dec. 15, 1909).

CORNSTALKS for paper. Paper Makers' Mo. J. xl, No. 1, 11-12 (Jan. 15, 1902).

CORNSTALKS for paper. Pulp Paper Mag. Can. i, 128, 161-162 (Sept., Oct., 1903).

CORNSTALK paper. Paper Making xxvii, No. 11, 440; No. 12, 471 (Nov., Dec., 1908).

CORNSTALK paper. Paper Makers' Mo. J. xlviii, No. 6, 205 (June 15, 1910).

CORNSTALKS, the new panacea. Pulp Paper Mag. Can. vi, No. 11, 279-280 (Nov., 1908).

DIXON, J. W. Making paper pulp from cornstalks. U. S. Patent 51,432. Dec. 12, 1865.

Dodge, C. R., 1897, page 334.

DODGE, J. RICHARD. Maize paper and maize cloth. U. S. Dept. of Agr., Annual Report, 1863, 436-438.

DORNER, B. Treating maize straw and the leaves to obtain fodder for animals and cellulose suitable for paper manufacture. U. S. Patent 1,038,730. Sept. 17, 1912. English Patent 8,638. Apr. 7, 1911. C. A. vi, 3018. German Patent 257,993. Apr. 4, 1911. Expt. Sta. Rec. xxvii, 314; Papier-Ztg. xxxviii, No. 32, 1208 (1913); Chem.-Ztg., Rep., 1913, No. 41, 196.

DREWSEN, VIGO Paper fiber from cornstalks. U. S. Patent 1,229,422. June 12, 1917. C. A. xi, 2276; J. Soc. Chem. Ind. xxxvi, 923; Paper Makers' Mo. J. lv, 276-277 (Sept. 15, 1917); Paper xx, No. 22, 22-23 (Aug. 8, 1917); World's Paper Trade Rev. lxviii, No. 6, 238 (Aug. 10, 1917).

DREWSEN, V. See also *Bagasse*.

EXPERIMENTING with new paper material. Paper xv, No. 22, 26 (Feb. 10, 1915).

HAVE they solved the problem? U. S. Paper Maker, Nov. 1, 1908.

HOLLAND, H. Preparing corn husks for the manufacture of paper. U. S. Patent 878. Aug. 13, 1838.

Zea mays—Continued

INVESTIGATING substitutes for wood. Paper x, No. 3, 19 (Jan. 1, 1913).

Juritz, page 78.

Kirchner, vol. II, page 59.

LA FORGE, FREDERICK B. A practical study of corn cob utilization. Chem. Age xxviii, No. 9, 332-336 (Sept., 1920); Paper xxvii, No. 16, 15-18, 32 (Dec. 22, 1920).

Liotard. page 23.

MAIZE pulp. Paper Maker xlix, 215 (Feb., 1915).

MANNS, A. G. Process of preparing fibers from cornstalks and analogous pithy plants. U. S. Patent 811,419. Jan. 30, 1906. J. Soc. Chem. Ind. xxv, 280.

MANUFACTURING paper from cornstalks. Sci. Am. xcix, 274 (Oct. 24, 1908); Harper's Weekly, Oct. 31, 1908.

MARVELS of cornstalks. Paper Makers' Mo. J. xlvii, No. 1, 11, 383-384 (Nov. 15, 1909).

NEW paper material. Sci. Am. ciii, 509-510 (Dec. 24, 1910).

NOBLE, G. R. More about cornstalks and bagasse. Pulp Paper Mag. Can. vii, No. 7, 218-219 (Aug., 1909).

PALLAS, EMANUEL. Recherches historiques, chimiques, agricoles et industrielles, sur le mais ou blé de Turquie, suivies de l'art de fabriquer le sucre et le papier avec la tige de cette plante, sans diminuer la quantité de son produit sous le rapport alimentaire. Paris, Schwartz et Gagnot, 1837.

2 p. l, iii-vi, 213 p. 23.5 cm.

Historical, chemical, agricultural and industrial study of the maize or Indian corn; followed by the art of manufacturing sugar and paper from the stalks of this plant without lessening the quantity of its food product.

PAPER from cornstalks. Paper Trade Rev. xlii, No. 16, 26 (Apr. 26, 1906).

PAPER from cornstalks. Paper Trade J. xlviii, No. 25 (1909).

PAPER from Indian corn. Sci. Am. Suppl. lxxii, 430 (Dec. 30, 1911).

PROCESS for cornstalks. Paper Making xxviii, No. 5, 194-196 (May, 1909).

SAWER, E. R. Cereals in South Africa. Cedara Memoirs on South African Agriculture. Vol. I. 1909.

Schaeffer, 1772.

SHERWOOD, GEORGE R. Fiber stock from cornstalks. U. S. Patent 905,374. Dec. 1, 1908. C. A. iii, 1084.

STEWART, F. L. Cellulose and sugar from cornstalks. Paper Trade J. xlix, No. 16, 52 (1909); Wochbl. Papierfabr. xl, 44-45 (1909).

STEWART, F. L. Process of treating maize. French Patent 451,961. Dec. 16, 1912. J. Soc. Chem. Ind. xxxii, 668.

Zea mays—Continued

TRAQUAIR, JOHN. Corn husks as papermaking material. Paper ix, No. 13, 29 (Dec. 11, 1912).

U. S. CONGRESS, House, Committee on Agriculture. Substitute for wood in the manufacture of paper pulp. Report (to accompany H. R. 24328, Washington. Govt. Printing Office, 1909). 8 p. 23 cm. (60th Congr., 2d. sess. House Report 2142).

Walsh, G. E., 1917.

WÜG, CARL B. New method of preparing pulp. U. S. Patent 1,084,244. Jan. 13, 1914. Pulp Paper Mag. Can. xii, No. 5, 145 (Mar. 1, 1914); C. A. viii, 1010.

WILL the cornfields furnish us paper? World's Work xvii, 10975-10976 (Dec., 1908).

Zingiber officinalis. Ginger.

BEADLE, C., and STEVENS, H. P. The ginger plant order (Zingiberaceae). Its value for papermaking. J. Soc. Chem. Ind. xxxii, 259-260 (1913); C. A. vii, 2306.

BEADLE, C., and STEVENS, H. P. Paper from plants of the ginger order. Paper xi, No. 6, 17-18 (Apr. 23, 1913).

Davis.

Stewart, C. J., Hall, H. D., and Beadle, H. 1917.

Zizania aquatica. Canada rice. Indian rice. Wild rice. Water oats. Tuscarora rice. Water rice.

Dodge, C. R., 1897, page 337.

Hannan, page 129.

Spon, vol. 1, page 999.

Valenta, 1904.

Zostera marina. Grass wrack. Sea wrack. Sea grass. Sea tang.

ALGAE as raw material for paper. Rev. papeterie; Papierfabr. viii, 287 (1910).

Dodge, C. R., 1897, page 337.

FRYDENSBERG, V. A. Papermaking material from sea tang. U. S. Patent 1,322,237. Nov. 18, 1919. English Patent 120,761. Nov. 19, 1917. C. A. xiii, 660; Paper xxiv, 534.

Hannan, page 126.

KUESS, V. J. Half stuff from sea grasses. French Patent 394,494. Sept. 21, 1908. J. Soc. Chem. Ind. xxviii, 257 (1909).

Montessus de Ballore, page 278.

PAPER from tang. Papier-Ztg. xiii, No. 60, 1201 (1917); xliii, 1226, 1254, 1546, 2223 (1918).

PAPER from sea tang. Wochbl. Papierfabr. xlix, No. 5, 203 (1918).

PUGE, A. Marine plants and their chemical uses. Ind. chim. vi, 231-234 (1919); C. A. xiv, 208.

Abbreviations Used

Agr. Bull. Federated Malay States	Agricultural Bulletin of the Federated Malay States. Director of Agriculture, Federated Malay States, Kuala Lumpur.
Agr. J. Cape Good Hope	Agricultural Journal of the Cape of Good Hope, The. Cape Town, South Africa.
Agr. News	Agricultural News, The. Advocate Co., Ltd., Broad street, Bridgetown, Barbados.
Am. Forestry	American Forestry. Washington, D. C.
Am. Homes	American Homes and Gardens (Now House and Garden), 19 West 44th street, New York, N. Y.
Am. Sugar Ind.	American Sugar Industry and Beet Sugar Gazette, 145 La Salle street, Chicago, Ill.
Ann. accad. agr. Torino	Turin. Reale academia d'agricoltura. Annali. Vincenzo Bona, Turin, Italy.
Ann. musèe colonial Marseille	Marseille. Musèe colonial. Annales. Marseille, France.
Aynsome Annual	Aynsome Annual. Aynsome Technical Laboratories, Grange-over-Sands, Lancashire, England.
Board Trade J.	Board of Trade Journal. London, England.
Bull. Agr. Intelligence	Bulletin of Agricultural Intelligence and Plant Diseases, Monthly. International Institute of Agriculture, Rome, Italy.
Bull. assoc. chim. sucr. dist.	Bulletin de l'association des chimistes de sucrerie et de distillerie. L. Raimbert, 156 Boulevard Magenta, Paris, France.
Bull. Commonwealth of Australia. Adv. Council Sci. and Ind.	Bulletin of the Commonwealth of Australia. Advisory Council of Science and Industry, Melbourne, Australia.
Bull. econ. gouv. gén. Indo Chine	Bulletin economique de l'Indo Chine. Hanoi, French Indo China.

Bull. fabr. papier	Bulletin-journal des fabricants de papier. Paris, France.
Bull. Imp. Inst.	Bulletin of the Imperial Institute. John Murray, Albemarle street, London, W., England.
Bull. Misc. Inform., Kew	Bulletin of Miscellaneous Information, Royal Gardens, Kew, England.
Bull. soc. encour. ind. nat.	Bulletin de la société d'encouragement pour l'industrie nationale. 44, Rue de Rennes, Paris, France.
Bull. soc. for. Belg.	Société centrale forestiere de Belgique. Bulletin. F. van Buggenhoudt, Brussels, Belgium.
Bull. soc. hyg.	Bulletin de la société scientifique d'hygiène alimentaire, et d'alimentation rationnelle de l'homme. Masson et Cie., 120 Blvd. Saint-Germain, Paris, France.
Bull. syndicat fabricants papier carton, France	Bulletin syndicat des fabricants de papier et de carton de France.
C. A.	Chemical Abstracts. Charles L. Parsons, Box 505, Washington, D. C.
Can. Municipal J.	Canadian Municipal Journal. Montreal, Canada.
Canadian Patent	Canadian Patent. Patent Office, Ottawa, Ont., Canada.
Cellulosechemie	Cellulosechemie. Otto Elsner, Oranienstrasse 140/42, Berlin S42, Germany.
Centr. Zuckerind.	Centralblatt für die Zuckerindustrie. Vereins Deutscher Zuckertechniker, 8 Guerickstrasse, Magdeburg, Germany.
Chem. Age	Chemical Age. McCready Publishing Co., 118 East 28th street, New York, N. Y.
Chem. Ind.	Chemische Industrie, Die. Weidmannsche Buchhandlung, Zimmerstrasse 94, Berlin, S. W., Germany.
Chem. Met. Eng.	Chemical and Metallurgical Engineering. McGraw-Hill Co., Inc., 10th avenue at 36th street, New York, N. Y.
Chem. News	Chemical News and Journal of Physical Science, The. 16 Newcastle street, Farrington street, E. C. 4, London, England.

Chem. Trade J.	Chemical Trade Journal and Chemical Engineer, 265, Strand, London, W. C., England.
Chem.-Ztg.	Chemiker-Zeitung. Otto v. Halen, Cöthen, Germany.
Chim. ind.	Chimie & industries. Société de chimie industrielle, 49 Rue de Mathurins, Paris, France.
Commerce Reports	Commerce Reports. Superintendent of Documents, Washington, D. C.
Compt. rend.	Comptes rendus hebdomadaires des séances de l'académie des sciences. Gauthier-Villars, 55 Quai des Grands-Augustins, Paris, France.
Compt. rend. agr., France	Comptes rendus des séances d'académie d'agriculture de France, 18 Rue de Bellechasse, Paris, France.
Consular Reports	Consular Reports. Superintendent of Documents, Washington, D. C.
Cotton Oil Press	Cotton Oil Press, The. Louis N. Geldert, Potter Bldg., Memphis, Tenn.
Country Life	Country Life in America. 116 West 32d street, New York, N. Y.
Current Opinion	Current Opinion. 63 West 36th street, New York, N. Y.
Daily Consular and Trade Reports	Daily Consular and Trade Reports. Superintendent of Documents, Washington, D. C.
Dallas Trade Rev. Ind. Record	Dallas Trade Review and Industrial Record, Dallas, Texas.
Dingler's polytech. J.	Dingler's polytechnisches Journal. Richard Dietze, Verlagsbuchhandlung, Berlin, W. 66, Germany.
Eighth Intern. Cong. Appl. Chem.	Eighth International Congress of Applied Chemistry. Rumford Press, Concord, N. H.
Eng. News	Engineering News (Now Engineering News-Record), McGraw-Hill Co., Inc., 10th avenue at 36th street, New York, N. Y.
English Patent	English Patent. Patent Office, London, England.

Expt. Sta. Rec.	Experiment Station Record. A. C. True, Office of Experiment Stations, U. S. Department of Agriculture, Washington, D. C.
Fiber and Fabric	Fiber and Fabric. 127 Federal street, Boston, Mass.
Foreign Office Diplomatic and Consular Reports	Great Britain. Foreign Office. Miscellaneous Series. Diplomatic and Consular Reports. H. M. Stationery Office, Imperial House, Kingsway, London, W. C. 2, England.
French Patent	French Patent. L'Imprimerie nationale, Rue Vielle-du-Temple, 87, Paris 3, France.
German Patent	German Patent. Der Reichsdruckerei, Berlin, Germany.
Harper's Weekly	Harper's Weekly (merged into The Independent). 119 West 40th street, New York, N. Y.
Ind. chim.	L'Industrie chimique, Revue universelle des produits chimique et des industries annexes. H. Mounier, 32, Rue le Peletier, Paris (IXe), France.
Independent	Independent, The. 119 West 40th street, New York, N. Y.
Indian Engineer	Indian Engineer (now Indian and Eastern Engineer). Calcutta, India.
Indian Engineering	Indian Engineering, Calcutta, India.
Indian Forest Records	Indian Forest Records. Dr. E. N. Munns, U. S. Forest Service, San Francisco, Cal.
Indian Forester	Indian Forester, The. Calcutta, India.
Indian Pharmacologist	Indian Pharmacologist. Calcutta, India.
Indian Planters' Gazette	Indian Planters' Gazette and Sporting News. Calcutta, India.
Indian Textile J.	Indian Textile Journal. Bombay, India.
L'Industria della carta	L'Industria della carta e della arti grafiche. Corso Principe Umberto 34, Milano, Italy.
Intern. Rev. Sci. Pract. Agr.	International Review of Science and Practice of Agriculture. International Institute of Agriculture, Rome, Italy.

Intern. Sugar J.	International Sugar Journal, The. 2, St. Dunstan's Hill, London, E. C., England.
J. agr. trop.	Journal d'agriculture tropicale. Paris, France.
J. Am. Chem. Soc.	Journal of the American Chemical Society. Charles L. Parsons, Box 505, Washington, D. C.
J. Am. Peat Soc.	Journal of the American Peat Society. American Peat Society, Toledo, Ohio.
J. Chem. Met. Soc. S. Africa	Journal of the Chemical, Metallurgical and Mining Society of South Africa. Fred Rowland, Sec'y., Old Municipal Bldgs., De Villiers street, Johannesburg, South Africa.
J. fabr. sucre	Journal des fabricants de sucre. Georges Dureau, 160 Boulevard de Magenta, Paris, France.
J. Forestry	Journal of Forestry. Society of American Foresters, Washington, D. C.
J. offic. Afrique Occid. Franc.	Journal officiel de l'Afrique Occidentale Française. Dakar (?), French West Africa.
J. Roy. Soc. Arts	Journal of the Royal Society of Arts. G. Bell and Sons, Ltd., York House, Portugal street, London, W. C., England.
J. Soc. Chem. Ind.	Journal of the Society of Chemical Industry. Charles G. Cresswell, Broadway Chambers, Westminster, London, S. W., England.
J. Soc. Dyers Colourists	Journal of the Society of Dyers and Colourists. Pearl Assurance Bldgs., Market street, Bradford, England.
Japanese Patent	Japanese Patent. Patent and Trade Mark Office, Department of Agriculture and Commerce, Tokio, Japan.
Manufacturers Record	Manufacturers Record. Manufacturers Record Publishing Company, corner Commerce and Water streets, Baltimore, Md.
Mitt. kgl. mech.-tech. Versuchs.	Mitteilungen aus den königlichen mechanisch-technischen Versuchsanstalten. Julius Springer, 23-24 Link-Strasse, Berlin W. 9, Germany.

Mitt. kgl. tech. Gew.-Mus. Wien	Mittheilungen des kaiserlichen königlichen technologischen Gewerbe-Museums in Wien. Vienna, Austria.
Mitt. Lab. Wiener Handelsakademie	Mitteilungen aus dem Laboratorium der Wiener Handelsakademie, Vienna, Austria.
Mon. produits chim.	Moniteur des produits chimiques. Paris, France.
Mon. sci.	Moniteur scientifique du Docteur Quesneville. Rue de Buci, 12 (Faubourg Saint-Germain), Paris, France.
Moniteur	Moniteur de la papeterie française, Le. Paris, France.
Monthly Consular and Trade Reports	Monthly Consular and Trade Reports. Superintendent of Documents. Washington, D. C.
La Nuova Agricultura del Lazio	La Nuova Agricultura del Lazio. Rome, Italy.
Oesterr. Chem.-Ztg.	Oesterreichische Chemiker-Zeitung Pestalozzigasse 6, Vienna, I, Austria
Paper	Paper, Inc., 251 West 19th street, New York, N. Y.
Paper Ind.	Paper Industry, The. Edward B Fritz, 356 Monadnock Block, Chicago, Ill.
Paper Maker	Paper Maker and British Paper Trade Journal, 47 Cannon street. London, E. C. 4, England.
Paper Makers' Mo. J.	Paper Makers' Monthly Journal, The. Marchant Singer and Company, 47 St. Mary avenue, London, E. C., England.
Paper Making	Paper Making. 5, Ludgate Circus Bldgs., London, E. C., England.
Paper Mill	Paper Mill and Wood Pulp News, The. L. D. Post, P. O. Box 592. New York, N. Y.
Paper Trade J.	Paper Trade Journal. Lockwood Trade Journal Co., 10 E. 39th street, New York, N. Y.
Paper Trade Rev.	Paper Trade Review. Edinburgh, Scotland.
Papeterie	Papeterie, La. L'Homme & Argy., Rue Lagrange 9, Paris, France.
Papier	Papier, Le. 339 Rue de Clérac-a-Sillac, Angoulême (16 Rue de Rocket), Paris (8e), France.

Papierfabr.	Papier-Fabrikant. Otto Elsner, Oranienstrasse 140-142, Berlin S. 42, Germany.
Papier-Ztg.	Papier-Zeitung. Papierhaus, Dessauer Strasse 2, Berlin S. W. 11, Germany.
Philipp. J. Sci.	Philippine Journal of Science, The. Library, Bureau of Science, Manila, Philippine Islands.
Prakt. Handbuch Papierfabr.	Praktisches Handbuch der Papierfabrikation. Papier-Zeitung, Papierhaus, Dessauer Strasse 2, Berlin S. W. 11, Germany.
Proc. Roy, Soc. Victoria	Proceedings of the Royal Society of Victoria. Melbourne, Australia.
Prog. agr. vit.	Progres agricole et viticole. Rue Albisson 1 (Rue National, Maison Batigne), Montpellier, France.
Publishers' Weekly	Publishers' Weekly, 62 West 45th street, New York, N. Y.
Pulp Paper Mag. Can.	Pulp and Paper Magazine of Canada. Industrial and Educational Publishing Co., Gardenvale, P. Q., Canada.
Queensland Agr. J.	Queensland Agricultural Journal, The. Brisbane, Australia.
Répert. pharm.	Répertoire de pharmacie. C. Crinon, 20, Boulevard Richard-Lenoir, Paris, 11e, France.
Rev. ind. agr. Tucumán	Revista industrial y agrìcola de Tucumán. Dirección Estación Experimental Agricola, Las Talitos, Casilla Correo 71, Tucumán, Argentine Republic.
Rev. papeterie	Revue de la papeterie française et étrangère. Paris, France.
Rhodesian Agr. J.	Rhodesian Agricultural Journal, The. Salisbury, Rhodesia.
S. African J. Ind.	South African Journal of Industries, Pretoria, South Africa.
S. Am. J.	South American Journal. London, England.
Sci. Am.	Scientific American. Scientific American Publishing Company, Munn and Company, 233 Broadway, New York, N. Y.

Sci. Am. Suppl.	Scientific American Supplement. Scientific American Publishing Company, Munn and Company, 233 Broadway, New York, N. Y.
Science Industry	Science and Industry. Commonwealth Institute of Science and Industry, Danks' Bldg., Bourke street, Melbourne, Australia.
Scottish Rev.	Scottish Review. Paisley, Scotland, also London, England.
Special Consular Reports	Special Consular Reports. Foreign and Domestic Commerce Bureau, Washington, D. C.
Sugar	Sugar. Beet Sugar Gazette Company, Hearst Bldg., Chicago, Ill.
Svensk Pappers-Tidning	Svensk Pappers-Tidning. Svenska Pappersbruksföreningen, Hovslagaregaton 3, Stockholm, Sweden.
Tech Eng. News	Tech Engineering News, The. Massachusetts Institute of Technology, Cambridge, Mass.
Tech. World Mag.	Technical World Magazine (now Illustrated World). Chicago, Ill.
Technics	Technics, London, England. (Only vols. 1-4 published.)
Tidskrift papirindustri	Tidskrift for papirindustri. Prinsens Gate 22, Kristiania, Norway.
Tropenpflanzer	Tropenpflanzer, Der. Berlin, Germany.
Tropical Agriculturist	Tropical Agriculturist. Colombo, Ceylon.
U. S. Patent	United States Patent. Commissioner of Patents, Washington, D. C.
Van Norden Mag.	Van Norden Magazine. New York, N. Y.
Wellcome Trop. Research Lab., Khartoum	Wellcome Tropical Research Laboratory, Khartoum, Sudan.
Wochbl. Papierfabr.	Wochenblatt für Papierfabrikation. Güntter-Staib, Biberacha. d. Riss, Württemberg, Germany.
Wochenschr. niederösterr. Gewerbe-Vereins	Wochenschrift des niederösterreichischen Gewerbe-Vereins. Vienna, Austria.
Wochenschr. Papier Schreibwaren Handel	Wochenschrift für den Papier- und Schreibwaren-Handel und die Papier verarbeitende Industrie. Potsdam, Germany.